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THE PHILOSOPHICAL TRANSACTIONS

From the Year MDCC.

(Where Mr. *LOWTHORP* ends)

To the Year MDCCXX.

ABRIDG'D,

AND

Diſpos'd under General HEADS.

By BENJ. MOTTE.

VOL. II. Containing

Part III. The PHYSIOLOGICAL Papers.
Part IV. The PHILOLOGICAL Papers.

LONDON:

Printed for R. WILKIN, R. ROBINSON, S. BALLARD,
W. and J. INNYS, and J. OSBORN. MDCCXXI.

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MVSEVM
BRITAÑ
NICVM

To the RIGHT HONOURABLE

EDWARD,
LORD
HARLEY,

THIS Continuation of an ABRIDGMENT, which appear'd under the Auſpicious Protection of His NOBLE FATHER, is moſt humbly dedicated by

His LORDSHIP's

Obedient, Devoted,

Humble Servant,

BENJ. MOTTE

THE
Philoſophical Tranſactions

From the Year 1700. to 1720.

Abridg'd and Methodically Digeſted.

PART III.

The *Phyſiological* Papers.

CHAP. I.

Phyſiology, Meteorology, Pneumaticks.

I. A Scale of the Degrees of Heat, by --- n. 270. p. 824.

Calorum Deſcriptiones & ſigna.

0		CALOR aeris hyberni, ubi aqua incipit gelu rigeſcere. Innoteſcit hic calor accurate locando Thermometrum in nive compreſſa, quo tempore gelu ſolvitur.
0,1,2		Calores aeris hyberni.
2,3,4		Calores aeris verni & autumnalis.
4,5,6		Calores aeris æſtivi.
6		Calor aeris meridiani circa menſem Julium.
12	1	Calor maximus quem Thermometer ad contactum corporis humani concipit. Idem circiter eſt calor avis ova incubantis.
$14\frac{3}{11}$	$1\frac{1}{4}$	Calor balnei prope maximus, quem quis manu immerſa & conſtanter agitata diutius perferre poteſt. Idem fere eſt calor ſanguinis recens effuſi.
17	$1\frac{1}{2}$	Calor balnei maximus, quem quis manu immerſa & immobili manente diutius perferre poteſt.
$20\frac{2}{11}$	$1\frac{3}{4}$	Calor balnei quo cera innatans & liquefacta defervendo rigeſcit & diaphaneitatem amittit.
24	2	Calor balnei quo cera innatans incaleſcendo liqueſcit & in continuo fluxu ſine ebullitione conſervatur.

$28\frac{4}{11}$	$2\frac{1}{4}$	Calor mediocris inter calores quo cera liqueſcit & aqua ebullit.
34	$2\frac{1}{2}$	Calor quo aqua vehementer ebullit, & miſtura duarum partium plumbi, trium partium ſtanni & quinque partium biſmuti defervendo rigeſcit. Incipit aqua ebullire calore partium 33 & calorem partium pluſquam $34\frac{1}{2}$ ebulliendo vix concipit. Ferrum verò deferveſcens calore partium 35 vel 36, ubi aqua calida, & 37 ubi frigida, in ipſum guttatim incidit, deſinit ebullitionem excitare.
$40\frac{4}{11}$	$2\frac{3}{4}$	Calor minimus quo miſtura unius partis Plumbi, quatuor partium Stanni & quinque partium Biſmuti incaleſcendo liqueſcit, & in continuo fluxu conſervatur.
48	3	Calor minimus quo miſtura æqualium partium ſtanni & biſmuti liqueſcit. Hæc miſtura calore partium 47 defervendo coagulatur.
57	$3\frac{1}{4}$	Calor quo miſtura duarum partium ſtanni & unius partis biſmuti funditur, ut & miſtura trium partium ſtanni & duarum plumbi; ſed miſtura quinq; partium ſtanni & duarum partium biſmuti hoc calore defervendo rigeſcit. Et idem facit miſtura æqualium partium plumbi & biſmuti.
68	$3\frac{1}{2}$	Calor minimus quo miſtura unius partis biſmuti & octo partium ſtanni funditur. Stannum per ſe funditur calore partium 72, & defervendo rigeſcit calore partium 70.
81	$3\frac{3}{4}$	Calor quo biſmutum funditur ut & miſtura quatuor partium plumbi & unius partis ſtanni. Sed miſtura quinque partium plumbi & unius partis ſtanni ubi fuſa eſt & defervet in hoc calore rigeſcit.
96	4	Calor minimus quo plumbum funditur. Plumbum incaleſcendo funditur calore partium 96 vel 97 & defervendo rigeſcit calore partium 95.
114	$4\frac{1}{4}$	Calor quo corpora ignita defervendo penitus deſinunt in tenebris nocturnis lucere, & viciſſim incaleſcendo incipiunt in iiſdem tenebris lucere, ſed luce tenuiſſima quæ ſentiri vix poſſit. Hoc calore liqueſcit miſtura æqualium partium Stanni & Reguli martis, & miſtura ſeptem partium biſmuti & quatuor partium ejuſdem Reguli defervendo rigeſcit.
136	$4\frac{1}{2}$	Calor quo corpora ignita in tenebris nocturnis candent, in crepuſculo vero neutiquam. Hoc calore tum miſtura duarum partium reguli martis & unius partis Biſmuti, tum etiam miſtura quinq; partium reguli martis & unius partis Stanni defervendo rigeſcit. Regulus per ſe rigeſcit calore partium 146.

161	4¾	Calor quo corpora ignita in crepuſculo proxime ante ortum ſolis vel poſt occaſum ejus manifeſto candent, in clara vero diei luce neutiquam, aut non niſi perobſcure.
192	5	Calor prunarum in igne parvo culinari ex carbonibus foſſilibus bituminoſis conſtructo & abſq; uſu follium ardente. Idem eſt calor ferri in tali igne quantum poteſt candentis. Ignis parvi culinaris, qui ex lignis conſtat, calor paulo major eſt, nempe partium 200 vel 210. Et ignis magni major adhuc eſt calor, præſertim ſi follibus cieatur.

In columna prima habentur gradus caloris in proportione arithmetica, computum inchoando a calore quo aqua incipit gelu rigeſcere tanquam ab infimo caloris gradu ſeu commune termino caloris & frigoris, & ponendo calorem externum corporis humani eſſe partium duodecim. In ſecunda columna habentur gradus caloris in ratione geometrica ſic ut ſecundus gradus ſit duplo major primo, tertius item ſecundo, & quartus tertio, & primus ſit calor externus corporis humani ſenſibus æquatus. Patet autem per hanc Tabulam quod calor aquæ bullientis ſit fere triplo major quam calor corporis humani, & quod calor ſtanni liqueſcentis ſit ſextuplo major, & calor plumbi liqueſcentis octuplo major, & Reguli liqueſcentis duodecuplo major, & calor ordinarius ignis culinaris ſexdecim vel ſeptemdecim vicibus major quam calor idem corporis humani.

Conſtructa fuit hæc Tabula ope Thermometri & ferri candentis. Per Thermometrum inveni menſuram calorum omnium uſq; ad calorem quo ſtannum funditur, & per ferrum calefactum inveni menſuram reliquorum. Nam calor quem ferrum calefactum corporibus frigidis ſibi contiguis dato tempore communicat, hoc eſt, calor quem ferrum dato tempore amittit, eſt ut calor totus ferri. Ideoq; ſi tempora refrigerii ſumantur æqualia, calores erunt in ratione geometrica, & propterea per tabulam logarithmorum facile inveniri poſſunt.

Primum igitur per Thermometrum ex oleo lini conſtructum inveni quod ſi oleum ubi Thermometer in nive liqueſcente locabatur occupabat ſpatium partim 10000, idem oleum calore primi gradus ſeu corporis humani rarefactum occupabat ſpatium 10256, & calore aquæ jamjam ebullire incipientis ſpatium 10705, & calore aquæ vehementer ebullientis ſpatium 10725, & calore ſtanni liquefacti defervientis ubi incipit rigeſcere & conſiſtentiam amalgamatis induere ſpatium 11516 & ubi omnino rigeſcit ſpatium 11496. Igitur oleum rarefactum fuit ac dilatatum in ratione 40 ad 39 per calorem corporis humani, in ratione 15 ad 14 per calorem aquæ bullientis, in ratione 15 ad 13 per calorem ſtanni defervientis ubi incipit coagulari & rigeſcere, & in ratione 23 ad 20 per calorem quo ſtannum deferviens omnino rigeſcit. Rarefactio aeris æquali calore fuit decuplo major quam rarefactio olei, & rarefactio olei quaſi quindecim vicibus major quam rarefactio ſpiritus vini. Et ex his inventis ponendo calores olei ipſius rarefactioni proportionales & pro calore corporis humani ſcribendo partes 12, prodiit calor aquæ ubi incipit ebullire partium 33, & ubi vehementius ebullit partium 34; & calor

ſtanni ubi vel liqueſcit vel deſervendo incipit rigeſcere & conſiſtentiam amalgamatis induere prodiit partium 72, & ubi deſervendo rigeſcit & induratur partium 70. His cognitis, ut reliqua inveſtigarem, calefeci ferrum ſatis craſſum donec ſatis canderet, & ex igne cum forcipe etiam candente exemptum locavi ſtatim in loco frigido ubi ventus conſtanter ſpirabat; huic imponendo particulas diverſorum metallorum & aliorum corporum liquabilium notavi tempora refrigerii donec particulæ omnes amiſſa fluiditate rigeſcerent, & calor ferri æquaretur calori corporis humani. Deinde ponendo quod exceſſus calorum ferri & particularum rigeſcentium, ſupra calorem atmoſphæræ Thermometro inventum, eſſent in progreſſione geometrica ubi tempora ſunt in progreſſione Arithmetica, calores omnes innotuere. Locavi autem ferrum, non in aere tranquillo ſed in vento uniformiter ſpirante ut aer a ferro calefactus ſemper abriperetur a vento, & aer frigidus in locum ejus uniformi cum motu ſuccederet. Sic enim aeris partes æquales æqualibus temporibus calefactæ ſunt & calorem conceperunt calori ferri proportionalem. Calores autem ſic inventi eandem habuerunt rationem inter ſe, cum caloribus per Thermometrum inventis, & propterea rarefactiones olei ipſius caloribus proportionales eſſe recte aſſumpſimus.

Obſervations on the Diſſolutions and Fermentations which we may call Cold, by Monſieur Geoffroy. N. 274 p. 951.

II. The Mixture of the greateſt part of the Salts in many Liquors is accompanied with a ſenſible Coldneſs of the Liquors, notwithſtanding the prompt and violent Fermentations which follow many of theſe Mixtures. I have diſtinguiſh'd the Diſſolutions or Mixtures into two Claſſes. In the former I comprehend all the Simple Cold Diſſolutions; that is to ſay, Thoſe Diſſolutions which are not accompanied with any ſenſible Ferment. The ſecond takes in only the cold Ferments, or Diſſolutions of Salts, which are accompanied with a ſenſible Ferment, and a Coldneſs of the Liquor.

Of Simple Cold Diſſolutions. Diſſolutions of Salts ſalted in common Water.

Claſs 1. I put a Pint of common Water into a Viol, and an ordinary Thermometer of 18 Inches in the Water, and ſo let it lie ſome time to fit itſelf in proportion to the Temperature of the Water. I afterwards put into the Water 4 Ounces of *Sal Armoniac*, and the Liquor of the Thermometer deſcended two Inches and 9 Lines, in leſs than a quarter of an Hour. Obſerving the ſame Circumſtances, I made the ſame Experiment with Salt-Peter, and the Liquor of the Thermometer deſcended one Inch 3 Lines. The ſame Experiment being made with Vitriol, the Liquor of the Thermometer deſcended almoſt an Inch. Sea-Salt made the Liquor deſcend but 2 Lines. And all the Salts being to be put in very lightly, I thought it the hardeſt Matter to pour it in aright.

Diſſolution of Alkali Volatil Salts in common Water,

All the Alkali Volatile Salts cooled the common Water by their Mixture, cauſing the Liquor of the Thermometer to deſcend by ſome Lines: But I obſerved that they cauſed it (to do ſo) more or leſs, according as they were more or leſs purified: And the Salt of Urine ſeem'd to do ſo ſooneſt of all.

Alkalous Lixivious Salts excepted from the general Rule, becauſe that ſome of them do Heat in their mixture with Water.

As for the Alkali Lixivious Salts, they were ſo far from cooling the Water in which they were mingled, that they heated it more or leſs, according as they were Calcined better or worſe. Upon the whole, one may obſerve that the Salts for heating Water ought to be purely Alkalous. For if they approach near the nature of Nitre or Sea-Salt, they Heat the Water but a little, or not at all, if they do not rather cool it. This is alſo done very conſiderably by the Salt of Tamariſc, extracted from the *Lixivium* of the Aſhes of this Vegetable.

Salts ſalted, mixed with the Acids of Vegetables.

Sal Armoniac mingled with the Acids of Vegetables, as diſtilled Vinegar, Juice of Limons or Verjuice, gave no mark of a Ferment, but cool'd theſe Liquors very much. An Ounce of *Sal Armoniac* caſt into 4 or 5 Ounces of Diſtilled Vinegar cauſed the Liquor of the Thermometer to deſcend 2 Inches 3 Lines. The ſame Salt, mixed with the Juice of Limons, cauſed the Liquor to deſcend 2 Inches. It does the ſame with Verjuice. Theſe are the mixtures of Salts with Liquors, which ſeem'd moſt remarkable, by reaſon of the Cold which they excited.

Of Cold Fermentations.

Salts ſalted, mixt with Acid Spirits.

Claſs 2. Salt-Peter caſt into its Acid Spirit raiſed ſome Smoke or Vapours, and cauſed the Liquor of the Thermometer to deſcend 4 Lines. Salt-Peter, mixed with Spirit of Vitriol, exhaled Smoke in great quantity, and cauſed the Liquor to deſcend from 6 to 7 Lines. In theſe two Experiments I put ~~half an~~ Ounce of Salt upon 3 Ounces of Liquor.

I put half an Ounce of *Sal Armoniac*, into 3 Ounces of Spirit of Nitre, and the Liquor of the Thermometer deſcended 2 Inches 5 Lines. This Mixture put forth ſome Vapours, which ſeem'd more conſiderable than thoſe which do ordinarily exhale from Spirit of Nitre alone. I poured half an Ounce of *Sal Armoniac* into 3 Ounces of Spirit of Vitrol, which made a violent Fermentation. The Subject Matter was conſiderably raiſed, and much Vapour went out, the Liquor was very thick, and the Thermometer deſcended 3 inches 6 lines. I obſerved, that the Vapours which were raiſed by this Mixture were Hot, and that they conſiderably raiſed the Liquor of the Thermometer, which I held hanging above the Subject Matter, tho' that which was dipp'd within did deſcend, and ſhew'd a very great Cold.

Sea-Salt excepted.

Sea-Salt mixed with Acid Spirits, Heats the Liquors, inſtead of cooling them. Being mixed with Spirit of Salt, it raiſed the Liquor of the Thermometer ſome Lines, without ſhewing any ſenſible Ferment. With Oil of Vitriol it ferments with a Noiſe, and raiſes a great Smoke: The Liquor thickens, and becomes a ſort of a clear Jelly. The Liquor of the Thermometer riſes very much in this Mixture, and the Heat is ſenſible to the Touch.

Volatile Alkalous Salts mingled with Acid Spirits.

All the Volatile Alkalous Salts mingled with different Acid Liquors, excited a Ferment more or leſs ſtrong, according to the Acidity of the Liquors, and the Purification of theſe Salts from their Fetid Oils. They all made the Liquor of the Thermometer to deſcend: but that which did ſo the moſt conſiderably, is the Salt of Urine. One Ounce of Volatile

Salt of Urine very well Rectify'd, in 4 Ounces in Diſtilled Vinegar, made a ſtrong Fermentation. The Subſtance is elevated very much, and with Noiſe; and the Liquor of the Thermometer deſcends in the Ferment one inch 9 lines. One Ounce of Volatile Salt of Urine, in 3 Ounces of Spirit of Vitriol, raiſed a violent Ferment, during which the Liquor of the Thermometer deſcended 2 inches 4 lines. The mixture of Salt of Tartar, or other fix'd Alkalous pure Salts, with Acid Liquors excited Fermentations with Heat.

Fixed Salts purely Alkalous excepted.

I made all theſe Experiments with the ſame Thermometer, when the Weather was ſufficiently Cold, and the Temperature of the Air equal enough.

Reaſon of the Cold and Diſſolution of Salts.

As to the Reaſon of theſe Experiments, I firſt of all examined the ſimple Cold Diſſolutions, and having (with all Phyſicians) fixed this Principle, That Cold is nothing but the Diminution of Motion; I ſay, that the Coldneſs which the Salts bring to the Water, ſeems to be occaſion'd from this, that the Salt Particles being without Motion, and dividing that Liquor, diminiſhes it ſo much the more. This (is that) which produces the Cold greater or leſs in the ſame Liquor.

Why the Thermometer riſes a little, the Diſſolution being made.

There is one thing to be obſerved, which is, that ſome time after the Diſſolution is made, the Liquor of the Thermometer riſes again a little. Which may be occaſioned by this, that the ſubtil matter which glided abundantly between the liquid Particles, had ceas'd to glide there in the ſame quantity for ſome time, the groſs Particles of the Salts oppoſing themſelves againſt their Paſſage; but theſe Saline Particles being divided by little and little, they opened again the Paſſages to the ſubtil Matter. This gave to the Liquor more Motion than it had at the beginning of the Diſſolution; but yet leſs than it had when it was pure and without Mixture; the Saline Particles, altho' diſſolv'd, abating ſomewhat of their Motion.

Whence proceeds the Heat of the Diſſolutions of Lixivious Salt.

We may eaſily comprehend why Lixivious Salts, purely Alkalous and well Calcin'd, as alſo the Salt of Tartar do heat the Liquor, and are very far from Cooling it, if we conſider that theſe Salts in the ſtrong Calcination which they have undergone, are loaded with many fiery Particles which they hold, as it were in Priſon in their Pores. Theſe igneous Particles regain their Liberty by the Diſſolution of the Saline Particles. And in the ſame time that theſe Salts ought to ſlacken the Motion of the Aqueous Particles, and cool it, the igneous Particles being very active, do augment the Agitation of the watry Particles, till they make it very hot.

Great Coldneſs of Sal Armoniac even to Freezing.

I obſerve next, that *Sal Armoniac* cools the Water wherein it is Diſſolved, more than any other Salt. Its Cold equals that of Water which is ready to Freeze. And it happen'd one time, that in diſſolving a good quantity of this Salt in Water, ſome Drops which fell on the outſide of the Viol in which I made the Diſſolution did Freeze, and the Straw upon which the Viol ſtood, being wet, was faſtned to the Glaſs Veſſel, for ſome time, by the Ice. This fell out ſince the Summer, at a time when the Weather was warm. I have many times ſince tryed the ſame Experiment, in different Ways, but without ever being able to produce the Ice. Chance had apparently made me meet, in this Experiment, not only a very exact Proportion between the Salt and the Water, but alſo a Temperature in the Water beſides, which I ſuppoſe neceſſary: becauſe the Diſſolution being quick, the Coldneſs muſt alſo be more ſudden and great: and this is that Degree of Temperature to which I could never afterwards attain.

Reaſons of the Coldneſs.

The great Coldneſs of the Diſſolution of *Sal Armoniac* proceeds not from any Difficulty which it has to be diſſolv'd, ſince it diſſolves ſooner than any other. And Sea-Salt, whoſe Diſſolution is difficult and very ſlow, is that which does leaſt cool its Diſſolver. On the contrary, it ſeems that the Facility and Readineſs with which it diſſolves, may be the Cauſe of this great Cold, in this manner. *Sal Armoniac*, as every body knows, is a Compoſition of Sea-Salt and Salt of Urine, the one very eaſy, the other very hard to diſſolve; the Particles of Sea Salt being, as it were, impriſon'd among the Particles of the Salt of Urine; it comes to paſs, that many of the Aqueous Particles, penetrating at firſt daſh the Saline Particles of the Urine, do there immediately loſe much of their Motion; and this Motion grows weaker by ſo much the more, as the Aqueous Particles meet afterwards with Saline Particles of another Nature, whoſe Reſiſtance is much more conſiderable, than that of the Salts of Urine. So in the firſt Inſtance of the Diſſolution, the Motion of a great quantity of Aqueous Particles being very much abated all at once, by the Salts of Urine, and by the Sea-Salt; it excited, in a few Moments, a Cold far greater than the Cold of other Diſſolutions of Salts, which the Water does not penetrate ſo readily. It may be Objected, That the Sea-Salt being the hardeſt to diſſolve, its Diſſolution would be alſo the Coldeſt. To which I anſwer, That this might be if the Water could penetrate ſuddenly into all its Parts: but the Slowneſs with which it penetrates them, becauſe of the cloſe Texture of the *Molecules* of this Salt, does hinder that the Diminution of the Motion of the Parts of the Water, can't be ſo ready, nor by conſequence ſo great: Whereas in *Sal Armoniac*, the Parts of the Sea-Salt being extended by the Salt of Urine, the Pores of the Alkalous Salt of Urine are like ſo many Ways open to the Parts of the Water, for going to penetrate the Parts of the Sea-Salt in numberleſs Places.

Experiment of a Saline Diſſolution exceſſively cold.

I place in the Rank of Cold Diſſolutions, the following Experiment which Monſieur *Homberg* made ſome time ago, before the Society. Take a Pound of Corroſive Sublimate, and a Pound of *Sal Armoniac*; powder them, each apart; then mix both the Powders very exactly, put the Mixture into a Viol, pouring upon it a Pint and half of diſtilled Vinegar, ſhaking it well together. This Compoſition will be ſo very Cold, that a Man can hardly hold the Veſſel in his Hands in Summer. And it chanced as Monſieur *Homberg* was making this Mixture, that the Subject froze. We ſee in this Experiment a Cold yet greater than that in the Diſſolution of ***Sal Armoniac*** alone in common Water. And this Cold is cauſed by the Corroſive Sublimate, which alone is not at all, or at leaſt very little Diſſoluble in diſtilled Vinegar. So that the fluid Parts of the diſtilled Vinegar, having quickly penetrated the Parts of the *Sal Armoniac*, and having already loſt a great deal of their Motion; engaging afterwards in the Pores of a Body which they could not diſſolve, and having Action not more than enough for that, they do there loſe that little Activity which they had. They coagulate there, if not at all, at leaſt the greateſt part: and this want of Action is the cauſe of that great Cold which we perceive there.

Explications of Cold Ferments.

In order to ſhew the Reaſon of Cold Ferments, I own (with the Phyſicians) that Heat and Cold in Liquors are neither more nor leſs than Motion in the little Parts of theſe Liquors, cauſed by the continual current of the Subtil Matter in the Spaces which theſe Particles do leave between them. And I affirm, that every time this Motion is diminiſhed, and when the Courſe of the Subtle Matter is interrupted, the Liquor appears leſs Hot or more Cold. This being ſuppoſed, if we do attend to that which happens in Cold Fermentations, we ſhall obſerve on the one Hand for the moſt part, very conſiderable Coagulations, and a very ſenſible Thickening of the Liquors: on the other Hand, we ſhall perceive a very violent Agitation of ſome of the Parts of theſe mixtures: Many Vapours are exhaled, the Matter ſwells, ſends out many Bubbles and Ferments with Noiſe. And in this manner I conceive that all theſe Effects are produced.

In the mixture which I made of Salts with Acid Liquors, the greateſt part of the Liquor coagulating with a part of the Salts, its Motion was much abated in a little time; but, its Parts not being able to coagulate, without ſtopping or weakning the current of the ſubtil matter, this matter finding the Paſſages ſhut up, takes its Courſe by the Interſtices, which remained between the coagulated Particles, where the Paſſage was yet free; and, as it glided away in a quantity together, it cauſed a very conſiderable Agitation in the Parts which it met with in its Paſſage. 'Tis this Agitation which cauſes the Fermentation which we perceive: 'Tis this which raiſes the Bubbles of Air and the Smoke: 'Tis this which puffs up and ſwells the matter with ſo much the more Violence, as all the parts of the Liquor being almoſt half coagulated, do hinder the Motion and Agitation of theſe little Particles. Nevertheleſs this Agitation, how violent ſoever it may appear, is not conſiderable enough to break the Coagulum intirely, which is formed in the Liquor, nor conſequently to overcome the Cold, which cauſes this Coagulation. All it can do, is to preſerve yet ſome kind of Fluidity. In ſhort, the more theſe mixtures are diſpos'd to coagulate, the more they excite the Cold. This we may ſee in the mixture of Sal Armoniac with Oil of Vitriol, in which the Coagulum becomes ſo ſtrong, that at laſt, it forms above the Liquor a very thick Saline Cruſt. In the mixture of other Salts with weaker Acids, as in the mixture of Volatil Salts with

Spirit of Vinegar, the Coagulum can hardly be perceived; nor is the Cold ſo conſiderable as in the former. I add farther, That even the violent Agitation which this mixture cauſes, being not univerſal, and paſſing no farther than ſome few places of the Liquor; it may for all that, contribute to the great Coldneſs in the mixture of Sal Armoniac and Oil of Vitriol, in encreaſing the Coagulum, ſo that the little Particles which are violently agitated in this Mixture, being not able to draw along with them in their Motion the Coagulated parts which are too groſs; they drive them away from the Center of their Motion: So that theſe Particles almoſt half coagulated, being got amongſt theſe little Whirl-pools, and preſs'd one againſt another, they ſtick cloſe to one another, coagulate ſtill more ſtrongly, and loſe their Motion entirely; which cauſes a very great cold. If any Man can ſcarce perſuade himſelf that the violent Agitation in ſome parts of the Mixture does contribute to the Coldneſs of the Liquor, he may be convinced by the following Experiment.

Experiment of Water cooled by Fire.

I put ſome cold Water into a great Baſin, I put into the middle of the Water a Cucurbit of Glaſs full of Water equally cold, I put into the Cucurbit a very good Thermometer, which I let lie a good while for a Tryal. When it was adjuſted to a Degree proportionable to the Cold of the Water, I threw ſuddenly into the Water in the Baſin four or five Shovels full of Coals well kindled; and in an inſtant, the Liquor of the Thermometer deſcended 2 or 3 lines. After ſome Moments, the Liquor roſe again, when the Heat of the Water in the Baſin was communicated to the Veſſel of Glaſs.

Reaſon of this Experiment.

The Cold of the Water of the Cucurbit can't be attributed to any thing beſides the Preſſion or ſudden Condenſation which the Fire cauſed in the Water, wherein it was put. Which Condenſation may be explain'd in this manner. In the Inſtant that the burning Coals were thrown into the Water, the Vortex of the Subtil Matter by which it was turn'd round, being preſs'd by the Water which environed it, ſcatter'd with Violence all the Particles of the Water. This ſcattering being made all at a time in many Places of the Water in the Baſin all round the Veſſel of Glaſs: All the Particles which environ'd the Veſſel, being at once preſs'd on all Sides, were condenſed conſiderably and ſucceſſively. The Veſſel being in the Center of Preſſion, bore all the weight of this Preſſion, as well as the Liquor which contained it. And this Liquor loſt by its Condenſation very much of the Motion of the Liquid, which it had before, which was conſiderable enough to cauſe the Liquor of the Thermometer to fall. This Cold goes off quickly, becauſe all the Water in the Baſin being very much heated, it quickly heats alſo that in the Veſſel of Glaſs.

Reaſons of the Hot Vapours from the Cold Ferment caus'd by the mixture of Sal Armoniac and Oil of Vitriol.

As for the ſenſible Heat of the Vapours which riſe from the Mixture of *Sal Armoniac* with Oil of Vitriol; it is not difficult to find the Cauſe; if we conſider that theſe Vapours are but the moſt ſubtil and active Parts of this Mixture, which the ſubtil Matter raiſes within it croſſing it.

The Motion of theſe Particles is free in the Air; it is but more repreſſed by the too groſs coagulated Particles. It becomes by ſo much the more violent, by how much it has been retain'd and hindred for ſome time; and is perceived by Heat, which is the ordinary Effect of rapid and violent Motion.

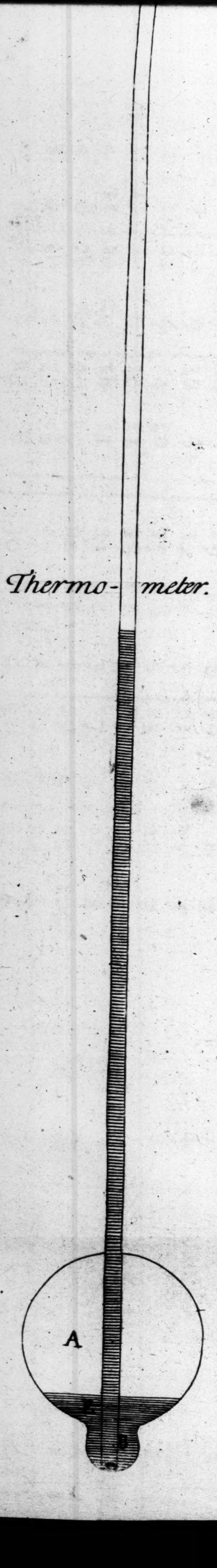
Change of the Cold Ferment from the mixture of Sal Armoniac and Oil of Vitriol, into a very hot Ferment with a little Water.

If after having made the Mixture of 4 Ounces of Oil of Vitriol, and an Ounce of *Sal Armoniac*, one throws upon it a ſpoonful of common Water, in the time when the Fermentation is ſtrongeſt, the Cold is greateſt, and the Thermometer falls with the greateſt Quickneſs; the Ferment ceaſes, and the Cold changes immediately into a great Heat, and makes the Liquor of the Thermometer to riſe very high. One may eaſily conceive the Reaſon of this Experiment, if we conſider that the Water heating quickly and ſtrongly with the Oil of Vitriol, makes here the ſame Effect. And this Heat is ſufficiently great at that time to deſtroy the Cold of the coagulated Particles, the Water by it ſelf being otherwiſe very proper to diſſolve this *Coagulum*.

A New Thermometer, ib. *p.* 962.

III. It is compos'd of a Bowl or Bottle of Glaſs, which has no opening, but by a little Tunnel at the end; and which deſcends to the bottom. This Tunnel is open at both ends, B C. B dips into the Liquor E which is at the bottom of the Bowl. The ſpace of the Bottle of Glaſs is fill'd with Air, which has no Communication with the Exterior Air. When the Air contained in this ſpace is rarefy'd by the exterior Air which touches the Bottle, it preſſes at the ſame time the Liquor E, and obliges it to riſe by B in the Tunnel B C. On the contrary, when it Condenſeth by the exterior Cold, by not preſſing the Liquor E, it permits that which is in the Tunnel to fall. The Readineſs with which the Air Condenſes or Rarefies by Cold and to Heat, makes the Effects of this Thermometer much more ſudden than thoſe of any other ſort. Beſides, the Effects of this is much greater, the Air being more capable of a great Rarefaction, or of a great Condenſation, than any other Liquor.

Plate 1 & 2. Part III. P. 10.


Thermo-meter.

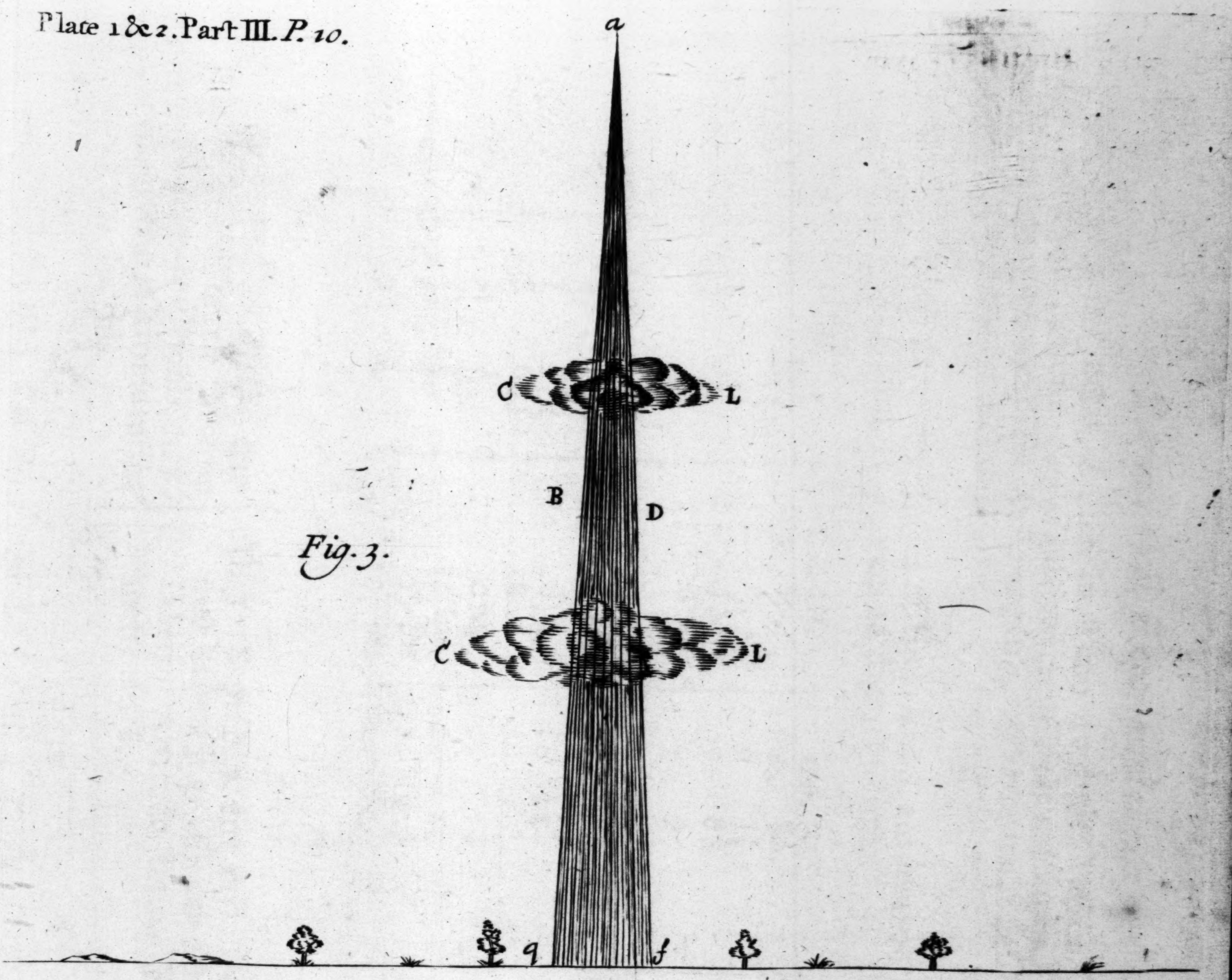


Fig. 3.

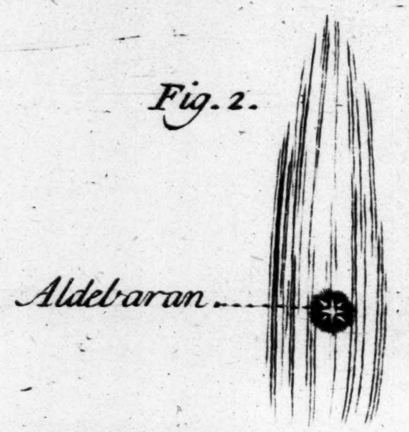


Fig. 2.

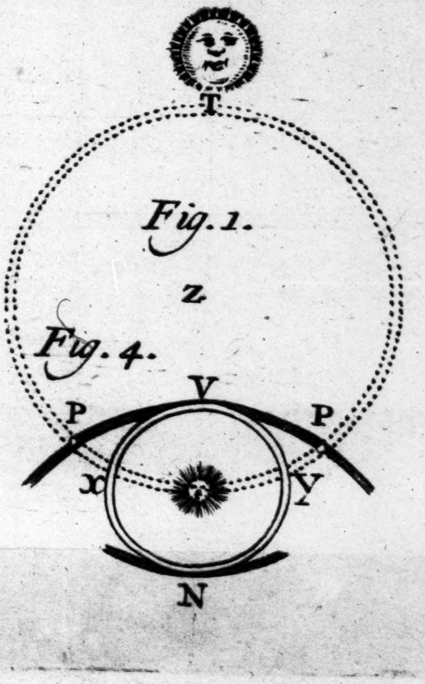


Fig. 1.
Fig. 4.

IV. Columna *prima* notat Aerem in Tubo 32 digit. Pariſin. longo, 2 linn. diametro, relictum. *Secunda* altitudinem Mercurii ſupra Argenti vivi ſuperficiem; *Tertia* ſpatia Aeris expanſi. *Quarta* notat deſcenſum Mercurii propter Aerem relictum.

I. *Barometrical Experiments in* Switzerland, *by Dr.* Scheuchzer. *n.* 344. *p.* 266.

D. *6*. Septembr. *Tiguri*, Barometri totius altitudo hor. 8. ant. erat 26 digit. *Pariſienſ.* 4 linn. H. $9\frac{1}{2}$ vero 26 digg. $4\frac{1}{2}$ linn.

Col. I.	Col. II.		Col. III.		Col. IV.	
digg.	digg.	lin.	digg.	lin.	digg.	lin.
3	19	9 bis	12	$6\frac{1}{2}$ bis	6	$7\frac{1}{2}$
6	16	8	15	$7\frac{1}{2}$	9	$8\frac{1}{2}$
	16	$7\frac{1}{2}$	15	8	9	9
9						
12	11	11 bis	20	3 bis	14	$5\frac{1}{2}$
15	9	9 bis	22	6 bis	16	$7\frac{1}{2}$
18	7	$5\frac{1}{2}$	24	$8\frac{1}{2}$	18	11
	7	6	24	8	18	$10\frac{1}{2}$
21	5	3	27	0 bis	21	$1\frac{1}{2}$
24	3	3	28	11 bis	23	$1\frac{1}{2}$
27	1	6	30	$7\frac{1}{2}$ bis	24	$10\frac{1}{2}$
30	0	4	31	$10\frac{1}{2}$ bis	26	0

D. 11. Sept. in Paſcuo *Alpino* Ennenſetwen gen Averen Montis Liberi, *Glaronenſis* ditionis, h. 1. pom. cœlo ſereno. Altitudo totius Barometri 23. 10. bis.

Col. I.	Col. II.		Col. III.		Col. IV.	
digg.	digg.	lin.	digg.	lin.	digg.	lin.
3	18	7	13	6	5	3
6	15	$7\frac{1}{2}$	16	4	8	$2\frac{1}{2}$
9	13	3	18	7	10	7
12	11	$1\frac{1}{2}$	20	9	12	$8\frac{1}{2}$
15	9	0	22	9	14	10
18	6	11	25	0	16	11
21	4	11	26	10	18	11
24	3	0	28	10	20	10
27	1	4	30	5	22	6
30	0	2	31	8	23	8

D. 12. Sept. h. 7. ant. cœlo ſereno, auff Scherf jugo editiore Montis Liberi. Altitudo totius Barometri 21. 8.

Col. I.	Col. II.		Col. III.		Col. IV.	
digg.	digg.	lin.	digg.	lin.	digg.	lin.
3	17	6	14	6	4	2
6	14	7	17	3	7	1
9	12	6	19	6	9	2
12	10	5	21	6	11	3
15	8	5	23	6	13	3
18	6	5	25	3	15	3
21	4	7	27	1	17	1
24	2	$9\frac{1}{2}$	29	$0\frac{1}{2}$	18	$10\frac{1}{2}$
27	1	4	30	6	20	4
30	0	2	31	8	21	6

D. 12. Sept. h. 9. ant. cœlo ſereno, **auff dem Blattenſtock** jugo editiore Montis Liberi. Altitudo tot. Barom. 21. 6.

Col.I.	Col. II.		Col. III.		Col. IV.	
digg.	digg.	lin.	digg.	lin.	digg.	lin.
3	17	2½	14	6	4	3½
6	14	5	17	5	7	1
9	12	4	19	6	9	2
12	10	4½	21	5	11	1½
15	8	7	23	4½	12	11
18	6	7	25	3	14	11
21	4	8	27	3	16	10
24	2	9	29	0	18	9
27	1	3	30	5	20	3
30	0	3	31	6	21	3

D. 14. Sept. h. 12. intra ipſam Venam Chalybis *Sarunetanam*, 300. incirca paſſus ab oſtio, cœlo foris ſereno. Barometri totius altitudo 24. 4. & 24. 3.

Col. I.	Col. II.		Col. III.		Col. IV.	
digg.	digg.	lin.	digg.	lin.	digg.	lin.
3	18	9	13	1	5	7
6	15	9	16	1	8	7
9	13	5	18	5	10	11
12	11	3	20	7	13	1
15	9	1	22	9	15	3
18	7	0	24	10	17	4
21	4	11	27	0	19	5
24	3	0	28	10	21	4
27	1	4	30	6	23	0
30	0	3	31	6	24	1

Extra Venam metallicam ſub dio eandem altitudinem obſervavi Mercurii in Barometro integro, item in 3 & 9 digg. Aeris in tubo relicti. Sed notandum eſt aerem in intimis fodinæ partibus, ubi experimenta feci, fuiſſe ob ignem præterito die accenſum (quo venam duriſſimam coquunt foſſores) rarefactum, & locum hypocauſti inſtar moderatè calefactum.

A Remark by —— ib. p. 268. *N. B.* Multis experimentis coram R. Societate factis compertum eſt, Aeris compreſſi vires Elaſticas eſſe ut pondera comprimentia directe. His Cl. *Scheuchzeri* obſervatis patet eandem in Aere rarefacto obtinere regulam quam proximè; Nam licet differentia aliqua reperiatur, tanta non eſt, ut ab inæqualitate diametri Tubi non facile oriatur. Ut autem experimenta hæc rite fiant, oportebit Tubi capacitatem, immiſſo unciatim Mercurio, in æquales partes dividi, loco partium longitudine æqualium.

A

V. *A Table ſhewing, at an eaſy View,* the Heights of the Mercury in the Barometer *in Engliſh Inches and Centeſimals of an Inch, both at* Zurich *in* Switzerland, *and at* Upminſter *in* South-Britain, *together with the Difference of thoſe Heights, throughout the Year* 1708.

The Barometrical Altitudes, Weather, &c. *at* Zurich, *by Dr.* Scheuchzer, *at* Upminſter, *by Mr.* Derham, *and at* Piſa, *by Dr.* Tilly, *compar'd by Mr.* Derham. *n.* 321. *p.* 342.

D. of Mo.	January.			February.			March.		
	Zurich *in* Eng. *Inches.*	Upm. *in* Engl. *Inches.*	*Differ. in* Engl. *Inches.*	Zurich *in* Engl. *Inches.*	Upm. *in* Engl. *Inches.*	*Dif. in* Engl. *Inches.*	Zurich *in Engl. Inches.*	Upm. *in English Inches.*	*Dif. in Engl. Inches.*
1	28 1	29 4	1 3	28	29 59	1 59	27 90	29 22	1 32
2				8	52	1 44	28	23	1 23
3	17	14	97	17	53	1 36	27 85	42	1 57
4	26	43	1 17	17	39	1 22	82	64	1 83
5	17	42	1 25	25	37	1 12	28	73	1 73
6	1	28	1 27	17	44	1 27	12	44	1 32
7	17	43	1 26	12	35	1 23	6	73	1 67
8	27 99	5	1 6	8	40	1 32	27 81	30 12	2 31
9	64	28 78	1 14	40	67	1 27	81	29 46	1 65
10	46	50	1 4	15	87	1 72	85	18	1 33
11	46	97	1 51	14	30 2	1 88	75	30	1 55
12	99	29 38	1 39	27 90	2	2 12	81	50	1 69
13	73	23	1 50	83	29 67	1 84	85	59	1 74
14	73	11	1 38	28	49	1 49	85	45	1 60
15	27 99	28 99	1	27 83	45	1 62	28 6	37	1 31
16				84	47	1 63	13	47	1 34
17	28 17	29 19	1 2	81	32	1 51	8	52	1 44
18	8	28 89	81	27 95	33	1 38	27 90	33	1 43
19	27 90	29 3	1 13	81	36	1 55	28 6	21	1 15
20	90	15	1 25	28	25	1 25			
21	81	28 80	99	17	8	91	27 85	34	1 49
22	73	95	1 22	38	41	1 3	72	8	1 36
23	99	29 12	1 13	35	48	1 13	72	13	1 41
24	90	20	1 30	17	47	1 30	85	6	1 21
25							81	34	1 53
26				20	25	1 5	75	29	1 54
27	81	57	1 66	15	22	1 7	85	16	1 31
28	81	95	2 14	27 95	28 99	1 4	28 4	38	1 34
29				85	94	1 9	27 90	37	1 47
30							95	6	1 11
31	28 08	76	1 68				28	14	1 14

	April.			May.			June.		
D. of M.	Zurich *in Eng. Inches.*	Up. *in Engliſh Inches*	*Dif. in Engliſh Inches.*	Zurich *in Engliſh Inches.*	Upm. *in Engliſh Inches.*	*Dif. in Engliſh Inches.*	Zurich *in Engl. Inches.*	Upm. *Engliſh Inches.*	*Dif. in Engliſh Inches.*
1	28	28 97	0 97	28 0	29 53	1 53	27 95	29 65	1 70
2	27 95	94	0 99	6	69	1 63	28 6	55	1 49
3	90	29 28	1 38				27 81	86	2 5
4	81	53	1 72	8	50	1 42	83	30 7	2 24
5	90	45	1 55	0	44	1 44	85	29 96	2 11
6	85	65	1 80	8	41	1 33	90	69	1 79
7	90	65	1 75	6	36	1 10	28 8	52	1 44
8	28	50	1 50				27 90	50	1 60
9	00	60	1 60	26	62	1 36	90	56	1 66
10	27 64	62	1 98	12	63	1 51	28 0	56	1 56
11	75	77	2 2	0	46	1 46	27 90	58	1 68
12	72	62	1 90	27 90	66	1 76	28 6	59	1 53
13	90	80	1 90	81	79	1 98	27 81	36	1 55
14	28	91	1 91	75	83	2 8	85	49	1 64
15	6	89	1 83	72	68	1 96	90	60	1 70
16	8	88	1 80	54	66	2 12	85	47	1 62
17	27 95	93	1 98				28 3	44	1 41
18	95	85	1 90	64	44	1 80	27 81	40	1 59
19	28	89	1 89	72	58	1 86	81	47	1 66
20	6	88	1 82	90	74	1 84	85	73	1 88
21	6			28 0	81	1 81			
22	8	30	1 92	0	59	1 59	90	70	1 80
23	00	29 80	1 80	27 95	54	1 59	97	70	1 73
24				28 8	67	1 59	85	43	1 58
25	8	80	1 72	17	80	1 63	96	45	1 49
26	12	85	1 73	15	86	1 71			
27				27 85	84	1 99	72	81	2 9
28	6	76	1 70	28 8	81	1 73	73	99	2 26
29				0	87	1 87	72	98	2 26
30	00	37	1 37	0	84	1 84	75	80	2 5
31				27 90	78	1 78			

D. of M.	July. Zurich in Engl. Inches.	July. Upm. in Engl. Inches.	July. Differ. in Engl. Inches.	Auguſt. Zurich in Engl. Inches.	Auguſt. Upm. in Engl. Inches.	Auguſt. Differ. in Engl. Inches.	September. Zurich in Engl. Inches.	September. Upm. in Engl. Inches.	September. Differ in Engl. Inches.
1	28	29 72	1 72	27 85	30 2	2 17	28 6	29 58	1 52
2	27 95	92	1 97	81	29 84	2 3	00	54	1 54
3	97	89	1 92	85	70	1 85	17	50	1 33
4	95	80	1 85	28 6	72	1 56	8	48	1 40
5	28	67	1 67	10	67	1 57	27 72	61	1 89
6	27 75	69	1 94	8	56	1 48			
7	81	72	1 91	0	57	1 57	72	45	1 73
8	28	69	1 69	27 81	93	2 12	72	49	1 77
9	8	68	1 60	85	98	2 13			
10	12	80	1 68	90	62	1 72	81	45	1 64
11	0	84	1 84	95	66	1 71			
12	27 81	90	2 9	28 8	89	1 81	64	67	2 3
13	93	83	1 90	0	93	1 93	46	48	2 2
14	28 6	68	1 62	27 85	93	2 8	72	43	1 71
15				75	84	2 9	85	28 65	0 80
16				72	80	2 8			
17	27 95	63	1 68	73	55	1 82	72	29 30	1 58
18	90	77	1 87	72	19	1 47	69	67	1 98
19	28	76	1 76	90	61	1 71			
20	27 72	84	2 12	95	81	1 86	72	88	2 16
21	28	66	1 66	72	93	2 21	75	86	2 11
22	6	50	1 44	81	77	1 96	75	85	2 10
23	17	56	1 39	90	93	2 3	75	96	2 21
24	8	84	1 76	95	53	1 58	81	30 20	2 39
25	6	73	1 67	28 00	51	1 51	56	17	2 61
26				00	51	1 51	50	12	2 62
27	27 95	82	1 87	27 95	52	1 57	64	89	2 25
28	85	54	1 69	85	63	1 78	81	94	2 13
29	95	66	1 71	28	51	1 51			
30	85	61	1 76	27 85	62	1 77	72	73	2 1
31	81	96	2 15	28 6	56	1 50			

Day of M.	October.			November.			December.		
	Zurich *in Engl. Inches.*	Upm. *in Engl. Inches.*	*Differ. in Engl. Inches.*	Zurich *in Engl. Inches.*	Upm. *in Engl. Inches.*	*Differ in Engliſh Inches.*	Zurich *in Engl. Inches.*	Upm. *in Engliſh Inches.*	*Differ. in Engliſh Inches.*
1	27 72	29 92	2 20	28 22	30 21	1 99	28 26	29 36	1 10
2	69	93	2 24	24	18	1 94	30	45	1 15
3							22	5	0 83
4							27 99	28 96	0 97
5	72	73	2 1	15	6	1 91	73	92	1 19
6	85	30 5	2 20	08	12	2 4	77	29 11	1 34
7				17	29 86	1 69	85	11	1 26
8	81	29 94	2 13				99	15	1 16
9				22	30 8	1 86	28 15	24	1 9
10	72	86	2 14	17	10	1 93	15	24	1 9
11	64	86	2 22	22	29 78	1 56	08	28	1 20
12	72	30 6	2 34				27 99	40	1 41
13				22	30 10	1 88	90	59	1 69
14	90	29 41	1 51	17	00	1 83	73	83	2 10
15									
16				22	15	1 93			
17	87	79	1 92	26			75	74	1 99
18	28 6	59	1 53				90	77	1 77
19	00	49	1 49	22	29 88	1 66	95	52	1 57
20	27 72	70	1 98				99	60	1 61
21	72	30 00	2 28	22	50	1 28	28 6	61	1 55
22	90	2	2 12				6	50	1 44
23	95	29 76	1 81	27 77	27	1 50	27 99	77	1 78
24	95	74	1 79	90	60	1 70	28 17	28	1 11
25	64	89	2 25	28 17	84	1 67	26	36	1 10
26	85	80	1 95				17	30 14	1 97
27	81	67	1 86				22	28	2 6
28	81	63	1 82						
29	28 00	64	1 64				17	29 83	1 66
30	27 90	80	1 90	26	45	1 19	15	80	1 65
31	28 00	73	1 73					49	1 32

A Table of the Rain at Piſa *in* Italy, *both in* Tuſcan, *and* Engliſh *Troy-Weight, which fell through a Tunnel of half a Brace Square, from* May *till the end of* December 1707. *As alſo the quantity of Rain at* Upminſter *in* Eſſex *at the ſame time, which fell through a round Tunnel of* 12 *Inches Diameter, in Pounds Troy, and Centeſimals of a Pound.*

	May.			June.			July.		
D. of M.	Piſa *Rain in Tuſcan Weight.*	Piſa *Rain reduced to Eng. W.*	*Rain at* Upminſter.	*Rain at* Piſa *in Tuſcan Weight.*	Piſa *Rain reduced to Engl. W.*	*Rain at* Upminſter.	Piſa *Rain in Tuſcan Weight.*	Piſa *Rain reduced to Eng. W*	*Rain at* Upminſter.
	l. oz.	*l. dec.*	*l. dec.*	*l. oz.*	*l. dec.*	*l. dec.*	*l. oz.*	*l. dec.*	*l. dec.*
1						0 17			0 1
2						2 90			
3						0 05			0 92
4									0 40
5									0 25
6						0 55	2 0	1 84	
7									
8				5 7	5 12				
9									
10						0 06			
11						0 02			0 60
12									1 12
13									0 3
14									
15						0 29			
16									0 17
17									0 16
18							0 3	0 23	
19									
20									
21									
22	0 9	0 69	2 70						0 94
23			1 26						0 65
24			0 17			0 85			
25						0 42			
26									
27						0 32			0 92
28						0 23			0 20
29			0 56						
30			0 56			0 81			
31	*Tot. wt.*	0 69	5 25		5 12	6 68		2 7	6 37
Dep. Inch.		0 12	1 05		0 88	1 34		0 35	1 27

	August.						September.						October.					
D. of M.	Piſa Rain in Tuſcan Weight.		Piſa Rain reduced to Engl. Po.		Rain at Upminſter.		Rain at Piſa in Tuſcan Weight.		Piſa Rain reduced to Engl. wt.		Rain at Upminſter.		Rain at Piſa in Tuſcan Weight.		Piſa Rain reduced to Eng. wt.		Rain at Upminſter.	
	l.	oz.	l.	dec.	l.	dec.	l.	oz.	l.	dec.	l.	dec.	l.	oz.	l.	dec.	l.	dec
1																		
2	1	1	1	0	1	90												
3																	2	54
4					0	76							4	8	4	28		
5					0	09											0	69
6					3	34					0	51						
7					0	16							7	7	6	96		
8					0	45					0	02						
9					0	81					0	04						
10											1	40	1	9	1	61		
11							0	5	0	38	0	70						
12													2	3	2	06		
13					0	10	0	4	0	31	0	51						
14					0	07	2	11	2	68	0	06						
15													3	10	3	52		
16													1	8	1	53		
17					1	68												
18											0	10						
19	32	5	29	75	0	10					0	87						
20	1	8	1	53	1	02	3	8	3	36								
21							7	9	7	11	1	65					1	62
22							10	0	9	18								
23							3	2	2	91							0	80
24	1	4	1	23			6	10	6	27	2	73					0	26
25											0	85						
26											0	46						
27											2	76						
28																	0	71
29							5	10	5	35								
30					0	31					1	84						
31					0	9												
Total wt.			33	51	10	88			37	55	14	50			19	96	6	62
Dep. in Inch			5	76	2	176			6	45	2	90			3	4	33	24

Day of M.	November.						December.					
	Rain at Piſa *in Tuſcan Weight.*		Piſa *Rain reduced to Eng. W.*		*Rain at* Upminſter.		*Rain at* Piſa *in Tuſcan Weight.*		Piſa *Rain reduced to Eng. Po.*		*Rain at* Upminſter.	
	l.	*oz.*	*l.*	*dec.*	*l.*	*dec.*	*l.*	*oz.*	*l.*	*dec.*	*l.*	*dec.*
1												
2							2	8	2	45	0	44
3					0	33					0	65
4												
5												
6											0	63
7											0	25
8							5	4	4	89		
9	9	4	8	57							0	84
10							2	10	2	60		
11												
12							2	8	2	45	1	67
13												
14					0	53						
15											1	24
16							3	10	3	52	0	96
17					0	32						
18												
19	3	9	3	44								
20							5	6	5	5	0	82
21					0	86					1	38
22											0	22
23	9	5	8	64							0	25
24	0	6	0	46	3	08						
25	2	4	2	14							0	16
26					0	28	3	2	2	91		
27	1	5	1	30			7	3	6	65	0	62
28											1	98
29							7	5	6	80		
30					0	50					0	03
31												
Total wt.			24	55	5	90			37	32	12	14
Dep. in In.			4	22	1	18			6	39	2	428

A Table of the Rain at Zurich *in* Switzerland, *at* Piſa, *and* Upminſter, *in the Year* 1708. *All reduc'd to the Depth in Engliſh Inches, and Centeſimals of an Inch.*

	January.							February.						
D. of Mo.	*Rain at* Zurich.	*Rain a* Piſa.		Piſa *Ra. reduced.*		*Rain at* Upm.		*Rain at* Zurich.	*Rain at* Piſa.		Piſa *Ra. reduced.*		*Rain at* Upm.	
	Inches.	*l.*	*oz.*	*l.*	*oz*	*l.*	*dec.*	*Inches*	*l.*	*oz.*	*l.*	*dec.*	*l.*	*dec.*
1		5	8	5	20									
2	1							2 ½	3	3	2	98		
3														
4		7	2	6	58	0	97	1 ¾						
5	1					0	29	¾	0	10	0	76		
6						0	7	2					0	2
7														
8								2						
9		6	3	5	74	0	53		2	4	2	14		
10						2	48		1	8	1	53		
11						1	26							
12								2 ½	0	9	0	69		
13						1	91							
14		3	4	3	6	1	88							
15	4					0	4	½					0	18
16						0	92							
17		5	6	5	5			1 ¾						
18		2	9	2	52	1	26							
19								4 ⅓						
20	1 ½							⅙	2	1	1	90	0	54
21	1												0	51
22	4					0	91							
23	2								7	2	6	58	0	64
24	2	3	6	3	21									
25	1 ½					1	7						0	19
26						0	80							
27		4	1	3	75									
28									2	9	2	52		
29	½							½					0	22
30														
31		2	5	2	22									
Tot.	18 ½			37	33	14	39	18 ¾			19-10		2	30
Dep.	1 64			6	41	2	878	1 65			3	28	0	46

	March.								April.							
Day of Mo.	*Rain at* Zurich.		*Ruin at* Piſa.		Piſa *Ra. reduced.*		*Rain at* Upm.		*Rain at* Zurich.		*Rain at* Piſa.		Piſa *Ra. reduced.*		*Rain at* Upm.	
	Inches.		*l.*	*oz.*	*l.*	*dec.*	*l.*	*dec.*	*Lines.*		*l.*	*oz.*	*l.*	*dec.*	.	*dec*
1	2	1/2							9	3/4					1	16
2											2	10	1	68	0	16
3									7	3/4	2	4	2	14		
4											0	9	0	69		
5															1	54
6							1	27								
7									1							
8									3							
9															0	16
10							0	38	1	1/4					0	24
11							0	37		3/4						
12	3	1/2													0	85
13			8	1	7	40										
14							0	37		1/5						
15		1/2														
16									4	3/4						
17									5	1/2	0	10	0	75		
18			6	3	5	74			3	1/6						
19	2	3/4					0	25			2	2	1	99		
20							0	8	5							
21							0	20								
22							1	37								
23	2	1/6					1	06	6							
24							1	37		1/2						
25							1	43	3	1/2						
26		3/4								1/3						
27							1	29								
28							0	15							0	65
29							0	54							0	01
30	1	1/2														
31	3	1/2	2	6	2	29										
Tot.	17	1/6			15	43	10	13	52	3/4			7	26	4	96
Dep.	1	51			2	65	2	3	4	69			1	25	0	96

Day of M.	May.							June.			July.		
	Rain at Zurich.	Rain at Piſa.		Piſa Rain reduced.		Rain at Upm.		Rain at Zurich.	Rain at Upm.		Rain at Zurich.	Rain at Upm.	
	Lines.	l.	oz.	l.	dec.	l.	dec.	Lines.	l.	dec.	Lines.	l.	dec.
1								1 1/2			1	0	06
2									0	66			
3						1	09	21 3/4			2 1/2		
4		5	1	4	66							0	03
5						0	27	2 1/2					
6		4	4	3	98						25 1/2		
7		3	10	3	52	3	28		0	60			
8						0	82	1 3/4	0	20		0	93
9						0	11		0	90		0	49
10									0	11		0	59
11												0	47
12	1 3/4								1	66		0	01
13						0	32	1/2	0	15		0	11
14	1/3								0	76			
15	2 1/3					1	11	3 3/4				1	00
16						0	82					0	16
17	1/3					0	01		0	01			
18						0	96		0	93	3		
19	5 3/4								0	04			
20	3 1/4							19			2 2/3		
21						0	53		2	66		0	01
22						0	79	1					
23									1	23			
24								6 1/4	0	80		0	01
25		3	4	3	06				0	44		0	41
26								1 1/4	0	38	3/4		
27	2 1/4												
28								1/2			3/4	1	20
29	1												
30		2	10	2	60			6 3/4	0	08	1/6	0	04
31	4 1/2	1	8	1	53						3		
Tot.	21 1/2			19	35	10	11	66 1/2	11	61	39 1/2	5	52
Dep.	1 91			3	33	2	02	5 91	3	32	3 50	1	11

D. of Mo.	Auguſt.			September.			October.			November.			December.		
	Rain at Zurich.	Rain at Upm.		Rain at Zurich.	Rain at Upmin		Rain at Zurich.	Rain at Upm.		Rain at Zurich.	Rain at Upm.		Rain at Zurich.	Rain at Upmin.	
	Lines.	l.	dec.	Lines.	l.	dec.	Lines.	l.	dec.	Lines.	l.	dec.	Lines.	l.	dec.
1														0	10
2								0	03						
3					0	74								0	61
4					0	06					0	92		0	08
5								0	08				17 ½	0	27
6					0	64									
7		3	38	2											
8				7 ¾	0	40								0	30
9				4 ¼										0	66
10					0	05									
11		0	07		0	01	4 ½				2	22			
12					1	41		0	06	¾	0	26			
13								0	37				8		
14				5 ¾	1	24		0	16						
15				2 ¾	1	10									
16															
17		1	05											0	54
18	3 ¾	0	56	7 ¾	0	29		0	31						
19														1	84
20															
21							13 ½							1	22
22															
23	27 ¾				0	27		0	02	6 ¾				4	00
24		0	15											0	22
25	1 ¼	0	76												
26							6 ¾								
27		0	31	3 ¾											
28								0	06						
29	2 ½	1	32		0	99									
30	¼				0	08					0	90	½		
31		7	10				2 ¾	0	05				3 ½		
Tot.	35 ½	14	70	34	7	28	27 ½	2	14	7	4	30	29 ½	9	84
Dep.	3 15	2	94	3 02	1	46	2 44	0	223	0 62	0	86	2 62	1	97

A Proſpect of all the Rain in the foregoing Tables, in every Month, Half Year, and the whole Year, from June 1. *N.S. or* May 21. *O. S.* 1707. *to the end of the Year* 1708.

	Depth of the Piſa *Rain.*	*Depth of the* Upm. *Rain.*	*Depth of the* Zurich *Rain.*
	Engl. Inch.	*Engl. Inches.*	*Engliſh Inches.*
May.	0 12	1 05	
June.	0 88	1 34	
July.	0 36	1 27	
Auguſt.	5 76	2 18	
September.	6 45	2 90	
October.	3 43	1 33	
November.	4 22	1 18	
The Half Years Rain.	21 22	11 25	
December.	6 39	2 43	
Anno 1708.			
January.	6 41	2 88	1 64
February.	3 28	0 46	1 65
March.	2 65	2 03	1 51
April.	1 25	0 96	4 69
May.	3 33	2 02	1 91
The Half Year's Rain.	23 31	10 78	
Depth of the whole Year's Rain.	44 53	22 03	
June.	4 90	2 32	5 91
The Half Year's Rain.		10 67	17 31
July.		1 11	3 50
Auguſt.	2 27	2 94	3 15
September.	7 21	1 46	3 02
October.	5 33	0 23	2 44
November.	0 13	0 86	0 62
December.		1 97	2 62
The Half Year's Rain.	19 84	8 57	15 35
The whole Year's Rain.		19 24	32 66

A Table of the Rain at Piſa *in ſome of the latter Six Months of the Year* 1708. *in* Tuſcan *Pounds and Ounces; and the ſame reduced to* Engliſh *Pounds Troy-Weight, and Centeſimal parts. Obſerved by Dr.* Michael Angelo Tilli.

	June.				July		August.			
	Tuſcan Weight		*Engliſh Weight.*				*Tuſcan Weight.*		*Engliſh Weight.*	
	l.	*oz.*	*l.*	*dec.*			*l.*	*oz.*	*l.*	*dec.*
1										
2	4	1	3	75						
3	2	2	1	99						
4										
5	3	4	3	06						
6	2	8	2	45						
7										
8	3	3	2	98						
9										
10	0	9	0	69						
11										
12										
13										
14	2	1	2	68			10	1	9	25
15	0	10	0	76			1	8	1	53
16										
17							2	8	2	45
18	11	1	10	17						
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
Total W.			28	53					13	23
Depth.			4	90					2	27

	September.				October.				November.			
D. of Mo.	*Tuſcan Weight.*		*Engliſh Weight.*		*Tuſcan Weight.*		*Engliſh Weight.*		*Tuſcan Weight*		*Engliſh Weight.*	
	l.	oz.	l.	dec.	l.	oz.	l.	dec.	l.	oz.	l.	dec.
1	1	2	1	07	5	1	4	67	3	3	2	98
2												
3	10	0	9	18								
4												
5												
6												
7	12	2	11	17								
8												
9					4	4	3	98	2	0	1	84
10												
11					14	5	13	13				
12									3	6	3	21
13												
14												
15	2	8	2	45	2	3	2	06				
16												
17												
18					2	6	2	29				
19					1	9	1	61				
20												
21	10	4	9	48								
22												
23												
24	9	4	8	57								
25												
26					3	7	3	29				
27												
28												
29												
30												
31												
Total W.			41	92			31	03			8	03
Depth.			7	21			5	33			0	13

As to Dr. *Scheuchzer*'s other Obſervations of the Winds, the Weather, the Thermometer, and divers other very curious and remarkable Matters, I have not inſerted them into particular Tables, becauſe theſe following general Remarks may in ſome meaſure ſupply that defect.

Dr. *Scheuchzer*'s Thermometer is about one Foot long; that I obſerved with all along (till it was broken this Year) about two Feet and a half; and that I now obſerve with, three Feet and a quarter; the bore of the Stalk is ſmall, and the Ball is large, and conſequently the Rang great, anſwering every the leaſt Alteration of Heat and Cold.

1. I obſerve by comparing Dr. *Scheuchzer*'s and my Thermometrical Obſervations. That notwithſtanding the *Alpine Snows* have mighty Effects on the Weather in *Switzerland*, and other conterminous Places, yet there is much more Agreement between the Heats and Cold at *Zurich* and *Upminſter*, than before comparing them, I imagined. (I ſpeak with relation to laſt Year only, having no other Obſervations.) For in Winter, although I imagine we have more warm Days than they; and in Summer, that they have greater Heats than we; yet I obſerve that the Colds and Heats in both Places, begin and end nearly about the ſame time: Yea, that oftentimes any remarkable Weather (eſpecially if of ſomewhat long continuance) affecteth one as well as the other Place. Thus for Inſtance, *June*, which was (ſome part of it at leaſt, particularly the very Day after the Solſtitial-day, *June* 12.) remarkably Cold in *England*, ſeems to have been not very different at *Zurich*; Dr. *Scheuchzer*'s Thermometer divers times that Month, (though not on the very ſame days perhaps) deſcending as low, or rather lower than in the Month before, yea as low as many days in the Winter Months. But one thing I farther obſerved was, that all this Month their cold Weather conſtantly preceeded ours here about five or more Days. An Indication that (as ſhall be farther obſerved hereafter) the Weather in both Places was influenced by the ſame Cauſes, whether the Alpine Hills and Cold, or the Influx of the Moon and other heavenly Bodies, or any other Cauſe, I ſhall not enquire. And as in *June* there was a great Agreement in the unuſual Cold, ſo in *Auguſt* there was not much leſs Agreement in Heat; the Heats in both Places being great, and beginning to abate about the ſame Time, only a little ſooner here than there. In Winter alſo, although as I ſaid, I imagine we have a great number of warmer Days than they, yet I find that a warm Winter Month there is ſo here; and a cold one there is a cold one here likewiſe. Thus in *February* and *March*, *October* and *November*, a great Agreement ſeems to have been between the Heats and Colds of both Places, ſome Days excepted. But *January* was at the beginning not ſo conſtantly Cold for the Seaſon at *Upminſter*, as it ſeems to have been at *Zurich*. And *December* laſt, which from the 8th Day to *Chriſtmas*-day, was here moderate and open Weather, and after that more intenſely Cold than even in the *Long Froſt*, *Anno* 1683. by the fewer Thermometrical Obſervations which Dr. *Scheuchzer* made then, than in other Months, the greateſt part I ſay, of that Month ſeems to have been intenſely cold at *Zurich* as the later part thereof was with us remarkably in *England*.

2. I did not enter the Winds into Tables, becauſe it may be ſufficient to obſerve in general, That although many Days they agree in both Places, yet there are many more in which they differ. When they do agree, I find it is chiefly when they are ſtrong, and of long continuance; and more I think when Northerly and Eaſterly, than in the other Points. Alſo I have obſerved, That a ſtrong Wind in one place, hath been a weak one in the other.

3. As to the *Barometrical Obſervations*, mine own I ſelected which were made at Noon; and Dr. *Scheuchzer*'s as near Noon as might be. For which reaſon I commonly took his Morning Obſervations, becauſe made for the moſt part about 10 or 11 of Clock. Alſo I took thoſe made with his Bent-Barometer; becauſe they ſeemed to me (eſpecially at the beginning of the Year) to be the moſt accurate. The Altitudes of his Mercury he meaſureth by the *Paris* Foot, which I have reduced to our *Engliſh* Meaſure, that they may be at an eaſy view compared with mine: For which reaſon I have alſo all along noted their Differences.

It is manifeſt from the Tables, That throughout the whole Year, the Mercury was lower at *Zurich* than at *Upminſter*, by ſometimes one, ſometimes above two Inches *Engliſh*. The moſt remarkable Difference was at the latter end of *September* and beginning of *October*, when the Difference was of a good while above two Inches *Engliſh*. The reaſon of which, I gueſs, was becauſe at *Zurich* I imagine the Air was more enclined to wet at that time, than at *Upminſter*; as alſo becauſe the Winds then were Northerly and Eaſterly with us; which, 'tis well known, do make our Barometers riſe, even in wet Weather. But the main Difference between Dr. *Scheuchzer*'s and my Barometers, I take to be about half an Inch *Engliſh*. From whence I conclude, That the Situation of *Zurich* is near a quarter of an *Engliſh* Mile higher than that of *Upminſter* above the ſurface of the Sea; or elſe that that part of the Terraqueous Globe, lying nearer the Line, is (according to the received Opinion) higher, or farther diſtant from the Center than ours is, lying nearer the Pole. Farther, It may be obſerved from the annexed Barometrical Tables, That (as near the Equinoctial the Barometer is obſerved to ſtand nearly at a Stay, but the more Northerly the Latitude, the greater the rang of the Mercury, ſo) at *Zurich* the Difference (laſt Year) was not ſo great between the higheſt and loweſt Stations of the ☿, as it was either at *Paris* or *Upminſter*. For at *Zurich* the Difference was only one Inch *Paris* Meaſure; at *Paris* Dr. *Scheuchzer* ſaith it was one Inch two Lines and an half; but at *Upminſter* it was 81. Inch, (and ſome Years 'tis more) which is greater than either of them.

The laſt thing which I ſhall take notice of relating to our Barometrical Obſervations is, That I obſerve, although there be ſome, and that a pretty deal of Agreement between the riſing and falling of our Barometers, one being very often high or low, when the other is ſo;

and one oftentimes riſing or falling when the other doth ſo; and one riſing much or little, or falling much or little when the other doth: I ſay although the matter is often thus, yet it is not ſo certainly ſo, as it is nearer Home*. In the *Hiſt. de l'Acad. Roy. des Scien. Anno* 1699. Monſieur *Meraldi*, by comparing his Obſervations at the *Paris Obſervatory* with mine at *Upminſter*, takes Notice: "That there is a great "Agreement between the Variation of the Heights of the Barometers "in both Places; that he finds almoſt always that when one riſeth or "falleth, the other doth ſo too, although not always alike: That the "Days in each Month whereon the Mercury hath been higheſt or loweſt, it hath been the ſame at *Paris* as at *Upminſter*, but ordinarily "ſomewhat more than 3 or 4 Lines lower at *Paris* than *Upminſter*". But the Agreement between the Variations of Dr. *Scheuchzer*'s Barometers and mine, although I ſay often great, yet is not ſo conſtantly, nor ſo certainly great as nearer Home, *viz.* at *London*, *Lancaſhire*, *Paris*, and other Places, with which I have made the Compariſon.

4. The firſt thing that in the Rain-Tables repreſents it ſelf to our View is, That the Rains for the moſt part are more frequent at *Upminſter* than either at *Zurich* or *Piſa*; I mean we have more Rainy Days than They.

Yet the Rains in both theſe Places are much greater in Quantity, in the whole Year, and in ſome Months, eſpecially the Autumnal and Winter Months, than our Rains are at *Upminſter*. *May*, *June* and *July* and a great part of *Auguſt* in 1707. ſeem to have been very dry, and I ſuppoſe ſearching Months at *Piſa*, as in ſome meaſure ſome of them were here: And in that time leſs Rain fell there than here. But the following Autumnal Months made at *Piſa* ſufficient amends, either by the great quantity that fell at a Time, I ſuppoſe in Thunder, and ſuch like haſty large Showers; or elſe by the quantity and frequency both. What a prodigious quantity was that, for Inſtance, of above 32 Pounds on *Auguſt* 19? (If it all fell on that, and not ſome on the preceeding Days.) But we find very large Quantities at a time to have fallen on divers Days, where it is manifeſt the Rain was weighed every Day, *viz.* 10 Pound, 9 Pound, and other large Quantities for ſeveral Days together, in the cooler autumnal Months. But as the Weather groweth warmer, I imagine their Rains at *Piſa* are fewer, and fall in large Quantities. For which reaſon the quantity of Rain in the Spring-months of *March*, *April*, and *May* 1708. (oftentimes dripping Months in *England*) is nearly the ſame both at *Piſa* and *Upminſter*. As to the Rains at *Zurich*, tho' they are leſs frequent than ours in *Eſſex*, yet they ſeem to be more frequent than theirs at *Piſa*: but the quantity at *Zurich* is greater than at *Upminſter*, and leſs than at *Piſa*.

* *v. n.* 286. *p.* 1443. *Abr. Tract.* VI. *infra.*

'Tis Dr. *Scheuchzer's* Opinion, “That more Rain falleth in *Switzerland* than in *France*, at *Zurich* than at *Paris*. To confirm which, he giveth us this Table of eight Years Rain at *Paris*, to which I ſhall add mine for *Upminſter*.

The Rain at Paris *in* 8 *Years.*							At Upm.	
The Year.	*Depth in Lines of* Paris *Meaſure.*	*Depth in Inches of* Paris *Meaſure.*			*Depth in* Engliſh *Inches & Centeſ.*		*Depth in* Engliſh *Inches and Centeſimals*	
		Inc.	*Lin.*					
1699	224 ¼	18	8	¼	19	93	15	11
1700	240 ½	20		½	21	37	19	03
1701	256 ¼	21	4	¼	22	77	18	69
1702	196 ¼	16	4	¼	17	45	20	38
1703	208 ¼	17	4	¼	18	51	23	99
1704	238 ½	19	10	½	21	20	15	80
1705	166 ¾	13	10	¾	14	82	16	93
1706	183 ½	15	3	½	16	31	24	29
Total	*Depth*	142	10¼		152	36	154	22

It is manifeſt from this Table, That the *Zurich* Rain laſt Year (although it amounted not to the Quantity which fell at *Piſa* in a whole Year, yet) exceeded both the *Paris* and *Upminſter* annual Rains of 8 Years before. 'Tis neceſſary that I take notice, That there is a greater difference between theſe laſt 8 Years Rain at *Paris* and *Upminſter*, than I found in the 8 Years, in which I * formerly compared the Rain of *Towneley*, *Paris*, *Liſle*, and *Upminſter* together. For by that Compariſon it appeared, that leſs Rain fell at *Upminſter* than at either of the other three Places. But according to theſe later 8 Years in the Table, a ſmall matter more falleth at *Upminſter* than at *Paris*. For the mean Proportion for *Paris* (which according to former Years was above 20 Inches *Paris* Meaſure, or 22 Inches *Engliſh*) is according to theſe laſt 8 Years no more than 17 Inches, 9 Lines, *Paris* Meaſure, or 19 Inches *Engliſh*: And *Upminſter*-Rain, which I formerly computed at, Year for Year, about 20 Inches and an half *Engliſh*, is for theſe 8 Years much the ſame, or a little more than that at *Paris*. The Proportions therefore which I ſhall lay down for the yearly Rain of all Places, whoſe Rain I have had Information of, are theſe; for *Zurich* (till farther Obſervations are made) 32½ Inches; for *Piſa* (till farther Obſervations alſo) 43¼ Inches; for *Paris* 19 Inches; for *Liſle*, 4 Inches; for *Towneley* in *Lancaſhire* 42½ Inches;

* *n.* 297. *p.* 1879. *v. Abr. Tract.* VII. *infra.*

Inches; for *Upminſter* 19 $\frac{1}{4}$ Inches; all the ſame, that is *Engliſh* Meaſure.

The laſt Obſervation I ſhall make upon the Rain Tables is, The great uſe of Cold to the making of Rain. That Exhalations and Vapours are the matter of Rain, is not to be doubted. When thoſe Vapours are raiſed, they are conſtipated and condenſed into Clouds and Rain, chiefly by the Cold of the Air to which they are elevated. And the greater the quantity of Vapours raiſed is, and withal the more intenſe the Cold of thoſe airy Regions, the greater is the quantity of Rain. This is manifeſt from the annexed Tables compared with Doctor *Scheuchzer's* and my Weather, *&c.* Obſervations. Thus for inſtance, *January*, which as Dr. *Scheuchzer* frequently obſerved, was ſometimes warm, ſometimes cold, and appeareth farther to have been ſo by his Thermometrical Column, and which was the ſame with us in *South-Britain*; that Month, I ſay, had plenty of Rain at *Zurich*, *Upminſter*, yea, and *Piſa* too. The ſame might be ſaid of *February* for *Zurich*, and probably *Piſa* too. So alſo for *December* in 1707. at *Piſa* and *Upminſter*; and *December* laſt at *Zurich* and *Upminſter*. But with us *February* was for the moſt part a cold Month, and the Rain the leſs, by reaſon the Vapours either could not be raiſed in plenty enough, or not be carried high enough, or ſuſpended long enough to be united, but ſoon were precipitated back again to the Earth. From the plenty of Exhalations and Cold of the airy Regions, I conceive it is, that at *Upminſter*, about the Equinoxes, we have often more Rain than at other Seaſons. But I cannot ſay this is certain and conſtant. Thus it was the Autumnal Equinox in 1707. not only at *Upminſter*, but at *Piſa* too: So at *Zurich*, *Piſa* and *Upminſter* about the Vernal in 1708. and at *Zurich* and *Upminſter* the laſt Autumnal Equinox. And this very 28th of *March* 1709. whilſt I am writing this, I have a pregnant Proof of what I am ſaying. For not only the unuſual Cold of the Winter hath been ſucceeded by as unuſual quantities of Rain all this Month; but at this very time the Weather is open, but withal cool. Particularly *March* 26. many Vapours aroſe, ſo as to fill the Air with a warm ſtinking Fog. The Night following, a ſmart Shower of Hail fell, a manifeſt Indication of the Cold of the middle, or top of the lower Region of the Air. And the Day after, *viz. March* 27. proved ſo wet a Day, that almoſt 5 Pound of Rain fell through my Tunnel, a large quantity for the Compaſs of 12 Inches Diameter in 14 or 15 Hours time. The Wind and Clouds were all the while calm and ſtill, and frequently changing from Point to Point, near round the whole Compaſs; and the Rain that fell, fell thick, in ſmall drops. Which makes me think, that the warm foggy Vapours, raiſed in great plenty the day or two before, as ſoon as they were mounted aloft, met with ſuddain extreme Cold of the middle Region, and were thereby haſtily condenſed, and the Air being at the ſame time very light (the Barometer being then very low) they ſpeedily tumbled down in ſmall and thick Drops of Rain.

And this I take to be the very Caſe of the vernal and autumnal Rains already mentioned, *viz.* In Spring, when the Earth and Waters are looſed from the brumal Conſtipations, the Vapours ariſe in great plenty. So alſo in Autumn, when the Heats that diſtipated them in Summer, and alſo warmed the ſuperior Regions, are abated, the Vapours raiſed then in great plenty are ſoon condenſed by the Cold of the ſuperior Regions, and ſo are forced down in more plentiful Rains than at other Seaſons, when either the Vapours are fewer, or Cold of the ſuperiour Regions leſs. For an Illuſtration of what hath been ſaid, let us again caſt an Eye upon *June* laſt, a Month as unſeaſonably wet, as 'twas unuſually Cold. The Cold thereof I have already taken notice of; and the wet Weather accompanying it was ſo unſeaſonable to us in *South-Britain*, that although we had great and welcome Crops of Hay after a great Scarcity the preceeding Year, yet we had ſcarcely any good Weather to make it in. So Dr. *Scheuchzer* ſaith it was with them in *Switzerland*, in his Remarks on that Month. *Fuit hic menſis, ut ex pluvia menſurata conſtat, præter modum humidus, & magno quidem Vegetabilibus Hominibuſque damno. Multum computruit Fœnum; Gramina, quæ nondum fuere reſecta, ad nimium venere maturitatis gradum. Vites earumque Floſculi multa ſuſtinuerunt damna a Pluviæ continuo fere lapſu; deciderunt tenella Petala, Foliis rubigo inducta eſt, ut macra admodum ſit Autumni venturi ſpes*, &c.

I ſhall ſhut up theſe Remarks with one thing concerning the *Alps*; and that is, I cannot but think that thoſe and all ſuch like high Mountains, and the Snows they are covered with, are of great uſe to the neighbouring, yea more diſtant Countries, in generating their Rain, and performing other great Offices of Nature. From ſome Obſervations I have made in running over, and comparing Dr. *Scheuchzer*'s and my own larger Tables, I have ſo frequently obſerved the Riſings and Fallings of the Barometer, ſome of the moſt conſiderable Variations of the Wind, the moſt remarkable Alterations of Heat and Cold, and of Wet and Dry; I have I ſay, ſo often obſerved many of theſe to precede in one place what hath follow'd in another, that I am apt to think that even *England* may ſometimes partake of the Effects of the *Alpine Mountains* upon the Air and Vapours. It is certain that their very cold Weather in *December* laſt, and the Relaxation thereof, preceded ours: Which makes me inclined to think it might probably be derived from them to us. All the former part of that Month, eſpecially from about the 8th Day till the 24th, was here mild and open. But on *Chriſtmas*-day it began to be colder, and the following Days to freeze harder and harder; inſomuch that on *December* 30. my Thermometer was a great deal lower than ever I had ſeen it before. And two curious Perſons in *London* told me, that the Spirits in their Thermometers fell ſeveral Degrees lower this laſt Winter, than they had done in the ſelf-ſame Thermometers during all the long and remarkable Froſt in the Year 1683. Whether at *Zurich* the Cold was more exceſſive, than it uſed to be in other Years, Dr. *Scheuchzer* doth not ſay ; but he noteth the Air to have been exceſſively cold, and his Thermometrical Obſervations ſhew it to have been ſo ſometime before, in and after *Chriſtmas*. And Dr. *Newton* in a Letter he honoured me with lately from *Florence*, ſaith, “ The Cold was there ſo great, that for twenty Years paſt they had not “ been ſenſible of greater ; it wanting on *Twelfth-day* but half a Degree “ of the Extremity. Their *Twelfth-day* I reckon fell on *December* 26. *O. S.* and conſequently their ſo eminently Freezing-day preceded ours about four Days”.

And as their Cold, ſo the Relaxation thereof preceded ours a ſhort time. For about the latter end of *December* the Weather appears to have been milder, at leaſt leſs intenſely Cold with them. And ſo was ours at the beginning of *January*, about as many Days after theirs, as their Cold preceded ours. Thus I have given one eminent Inſtance of what I found leſſer Examples frequently, as I run over Dr. *Scheuchzer*'s laſt Year's Obſervations. But whether there may be any further Reaſons for any ſuch Concluſions about the Influences of the Alpine Eminences and Colds upon far diſtant Places, future Obſervations will I hope determine. But as to the Influences near Home, Dr. *Scheuchzer* ſaith, *Alpes fœcunda mater ſunt, ut Fluminum & Nubium, ita quoque Nivis & Pluviæ. Credibile omnino eſt, loca Mari, Alpibuſque viciniora, plus etiam experiri Pluviæ remotioribus aliis.*

From Dr. *Tilly*'s Table of Rain at *Piſa* compared with the foregoing, it appears, that though in the Year before, *June* and other Summer-Months were *dry*, yet laſt *June* was a *wet* Month at *Piſa*, as well as *Zurich* and *Upminſter*, and ſo likewiſe was it about the Autumnal Equinox. As to the Exceſs of the *Piſa-Rain* above that of other Places, Dr. *Tilly* attributeth it to the ſame Cauſe that I did that of *Lancaſhire* ; namely, *the Height of the Hills, and the blowing of the Winds for a long time from ſome one Quarter*. His Obſervation is this ; *Libenter admitto Pluviam noſtram ſemper, vel ut plurimum, veſtram ſuperare, ea ſane ratione ut---------animadvertiſti ; & præcipue ſi aſpera* Corſica *juga, autumni tempore, nive cito cooperiantur: Tunc Auſtrales venti diu vigent & Imbres. Aquilonares vero frequentius circa Florentinos colles, quam circa Piſanam urbem ſpirare plane conſtat. Eſt enim hæc civitas a Borea circumdata montibus, & pari intervallo circa milliaria quinque diſtat a mari.* The ſame Account of the Situation of *Piſa*, and the great quantity of Rain falling there, I remember I had ſome time ſince from a very ingenious Member of this Society, Mr. *Aſton*, who hath been there ; who withal, added (if I miſtake not) that *Piſa* was for that reaſon called, or might be called, *The Piſs-Pot of* Italy.

The Weather at Oates *in* Eſſex *for* 1692. *by Mr.* Locke, *n.*298. *p.* 1917.

VI. The firſt Column, having D at the top, contains the Day of the Month. That with H, the Hour of the Day, which beginning from one of the Clock in the Morning, I count round in one continued Series to 24, which is 12 a Clock at Night. The Column *Ther.* is that of the Thermoſcope,

Thermoſcope, which was a ſealed one. The Column *Bar.* marks the height of the *Mercury* in the Baroſcope. The firſt number is the Inches of its height, the ſecond number marks the 20th parts of an Inch above that Inch marked by the firſt Number. The Column *Hyg.* is that which marks the moiſture of the Air. The Inſtrument I uſed was the Beard of a wild Oat, of which each Turn was divided into ſixteen Degrees.

The Column of the Wind mark'd the Point the Wind was in, but not always exactly, becauſe the Weather-Cock viſible out of my Window was ſtiff and turn'd not eaſily, nor was the Houſe it ſtood on ſituate exactly *Eaſt* and *Weſt*; ſo that it was not eaſy by the ſtanding of the Weather-Cock to know exactly the point of the Wind: Wherefore I contented my ſelf to ſet down barely one of the four cardinal Points, when the Wind was pretty near it; and when it was more remote, the two cardinal Points between which it was, putting the Letter of the cardinal Point firſt, to which it was neareſt; as when the Wind was between the *South* and the *Weſt*, if it were nearer the *Weſt* than the *South*, I writ W. S. and ſo of the reſt. I marked beſides the force of the Wind, which I divided into four Degrees. 1. When it juſt moved the Leaves. 2. When it blew a pretty freſh Gale. 3. When it was a hard and whiſtling Wind. 4. When it blew a Storm. Though theſe Diviſions were not made with Exactneſs as they might have been, had one had an Inſtrument on purpoſe, yet they may give ſome help to thoſe who would make Obſervations from ſuch Regiſters as theſe. (0) was when there was not Wind enough to move a Leaf as I could ſee.

As to the Weather. *Cloudy* ſignifies more of the Sky (viſible out of the Windows of my Study, which were *Eaſt* and *South*) cover'd with Clouds, than not. *Fair* the Contrary. *Between* when it was uncertain whether more of the Sky was cover'd or clear. *Covered* when no part of the clear Sky appear'd. *Cloſe*, when the Sky was cover'd with one uniform thick Cloud.

The Thermoſcope mark'd 4, which I made uſe of till *Mar.* 7. 1701. was one of thoſe ſold by Mr. *Tompion*, wherein 0 mark'd Temperate, and the Figures from thence increaſing both upwards and downwards, ſhew'd the increaſing of Heat and Cold from Temperate. *Sept.* 22. 1701. I began to uſe a new ſealed Thermoſcope, adjuſted to a Scale made by Mr. *John Patrick*, who places 0 at the top, ſuppoſing it to be the Heat under the Line, and ſo the Figures increaſe downwards, with the increaſe of Cold. Temperate being placed at 45. This Thermoſcope is marked 5 in my Regiſter.

DECEMBER, 1691.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather. *December* 1691.
		4				
9	16	1. 2	30. $\frac{4}{20}$		S. 1	Fog.
10	17	2. 1	4		S E 1	Fair.
11	10	3. 1	4		S E 1	Fog.
12	9	3. 6	3		E 1	Froſt, Cloſe.
13	9	3. 4	30. 0		E 1	Cloſe.
14	9	3. 7	29. 17		E 2	Froſt, Fair.
15	9	4. 2	30. 0		E 3	Froſt, Fair.
16	9	4. 4	4		E 3	Froſt, Fair.
17	9	4. 6	6		E 1	Froſt, Fair.
18	9	4.	5		NE 1	Cloſe.
19	9	3. 3	3		NE 1	Fog, Thaw.
	24		29. 19		1	Cloudy, a little Rain next Morning.
20	10	3. 4	18		N 1	Cloſe.
21	9	3. 6	19		N 1	Fog, Froſt.
22	9	4.	18		N 1	Cloſe.
24	10	2. 6	14		S W 2	Cloudy,
25	21	2. 1	15			Fair.
26	21	1. 7	13		W 3	Cloſe.
	24		12			Rain before next Morning.
27	18	1. 6	6			
28	16	2. 6	9		S W 2	Fair.
	22		8			Rain.
	24		7		S 2	Rain hard.
29	9	3.	4			Cloſe, and ſometime after Rain.
	19	2. 7	4			Snow beginning at 6.
30	8	3. 7	10		N W	Fair.
31	9	4. 7	12		N W 0	Fair, hard Froſt.
	17	3. 3	10		S E 1	Cloudy, Thaw.

JANUARY, 1692.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *January* 1692.
1	9	3. 7	29. 11	47	S E 1	Cloſe. Snow at 10.
2	9	3. 7	14	43	W 1	Fair.
3	9	3. 5	8	41	S 2	Clouds.
4	8	3. 6	11	43	S 1	Cloudy.
5	9	3. 7	13	43	S 1	Cloudy.
6	8	4. 3	11	36	S 2	Cloſe.
	16	4.	8	36	E 3	Cloſe.
	20	4. 2	6	41		Snow.
7	10	4. 1	7	45	E 2	Cloſe.
	24	3. 7	17			Cloſe.
8	9	4. 1	30	45	N E 1	Cloſe.
9	9	2. 6	29. 18	50	S 3	Cloſe.
	20		15			Rain.
10	9	2. 7	18	44	S W 1	Fair.
	12			26		In the Shade.
11	9	2. 6	30. 4	48	W N 1	Cloſe, with a little Fog.
	24	2. 5	30. 8	41		Very fair all the Afternoon, now cloſe.
12	9	2. 7	9	44	N 1	Miſty.
13	9	3. 4	9	46	S 1	Cloſe.
14	9	3. 7	7	48	E 1	Fog.
15	9	4. 4	6	31	E 1	Fog, Froſt.
16	9	4. 5	2	45	N 1	Fair, hard Froſt.
17	10	4. 1	29. 18	43	N E 2	Cloſe, hard Froſt.
18	8	4. 1	12	35	N W 2	Fair, Rain and Snow for an hour about 16.
19	9	3. 7	9	44	N W 2	Snow till 13
20	8	4. 5	5	43	NW 1	Fair. Some Clouds. Snow in the Afternoon.
21	9	5. 7	6		N 2	Fair. Snow in the Afternoon.
22	9	5. 6	9	18	N W 2	Very fair, hard Froſt.
	10	6. 2				In a Northern Cloſet without Fire at any time.
	24	6. 5½				In the ſame Cloſet, very hard Froſt.

D

D	H	Ther.	Bar.	Hyg.	Wind.		Weather. *January*, 1692.
		4		-			
23	9	5. 7	11	31	N W	2	Fair, Snow a little at 14.
24	9		11	28	N W	1	Cloudy, hard Froſt.
25	9	5. 6	10	31	N W	1	Fair, hard Froſt.
26	9	6. 0	9	32	N W	1	Cloudy, hard Froſt.
27	7	5. 3	7	33	N	1	Cloudy, hard Froſt.
28	9	4. 6	4	33	N	1	Snow in the Night, and Snow ſtill.
29	9	5. 6	2	32	W	1	Cloſe, Snow all Afternoon.

N. B. I ſuſpect that from the 23d to the 29th incluſively, the Hygroſcope has been counted 16 Degrees, *i. e.* one whole Turn too high, it being all that while very hard Froſt.

D	H	Ther.	Bar.	Hyg.	Wind.		Weather.
30	9	4. 4	2		N W	2	Snow.
31	9	5. 3	8		N W	1	Cloſe.

FEBRUART. 1692.

D	H	Ther.	Bar.	Hyg.	Wind.		Weather.
1	8	5. 0	10	19	W		Fog.
2	9	5. 6	11	19	W	1	Fog.
3	8	5. 7	11	20	W	1	Fog.
4	9	5. 5	9		E	2	Cloſe.
5	9	5. 4	7	26	E	3	Cloſe, Snow in the Evening.
6	9	5. 1	29. 0	20	E	1	Snow.
7	9	4. 6	2		N	1	Cloſe, Fog, little Thaw at 12.
8	9	4. 6	29. 0	40	N E	2	Fog, Snow in the Night.
9	8	5. 3	29. 0		N E	2	Snow.
10	9	5. 5	1		N E	2	Cloſe.
11	8	6.	8		W	1	Fair.
12	9	7. 0	11		N W		Cloſe, Freezing exceſſively.
13	9	4. 2	5		S W	1	Cloſe Thaw. It may be obſerved between the Thermoſcope to Day and Yeſterday Morning, there is the difference of two whole Degrees and $\frac{6}{8}$, a greater riſe than one ſhall ordinarily find. The Thermoſcope was unmoved in a corner of a very large Room, out of all reach of the Fire, whereby it might be alter'd.
14			7				Cloſe.
16	12		10				Cloſe.

D	H	Ther. 4.	Bar.	Hyg.	Wind	Weather. February, 1692.
17	19		9			Fog.
18	12		5		W	Snow.
26	2		11		W 2	Cloſe.
27	9	2. 3	29. 8		W 2	Fair. Rain from 15 to 19.
28	9	3. 1	6		W 1	Cloſe, Snow laſt Night.
29	9	3. 6	6		S W 2	Cloudy. Snow laſt Night.

MARCH. 1692.

D	H	Ther. 4.	Bar.	Hyg.	Wind	Weather.
1	8	2. 7	28. 17		S W 3	Fair.
2	8	3. 1	29. 5		S W 3	Fair.
3	7	2. 6	8		W S 2	Fair.
	16	1. 4	8		W S 1	Rain very gently till 20, hard till 23.
4	9	3. 1	14		N E 2	The Ground covered with Snow. Cloſe.
5	9	3. 4	18		W 2	Cloudy.
6	9	2. 4	11		W 2	Rain till 16.
	16	2. 0	9		W 1	Rain.
	22	2. 2	10			Fair.
7	9	3. 5	10		W 2	A little dropping.
	12		9		W N 2	Snow for ¼ Hour.
8	9	3. 3	14		W 1	Fair.
9	8	3. 3	15	25	S W 2	Fair.
10	9	6	19	17	S 1	Fair.
	17	2. 2	18	19	W 2	A little Rain.
11	9	1	19	25	W N 1	Cloſe.
12	9	5	30. 1	23	N W 1	Cloſe.
	14	2. 0	30. 0	24	W N 2	Cloſe. Small Rain at 15 till 16.
	16	1. 7	29. 19	40	W N 1	Very gentle Rain.
	23	7	16		N W 2	Hard Rain for 3 or 4 Hours paſt.
13	9	2. 3	13		WN	Very gentle ſmall Rain.
	12		11		N W 2	Fair.
14	9	2. 6	11	27	N W 2	Cloſe.
	16	5	13	25	N E 3	Fair
15	8	4. 0	16	25	N E 2	Cloſe. Froſt laſt Night.
16	9	3. 4	14	25	N W 1	Cloſe.
	13	0	13	20	N W 1	Fair. Rain in the Night.
17	9	3. 0	8	25	N E 1	Cloſe.
	13		7		S E 1	Cloudy.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather. *March*, 1692.
		4.				
	18	2. 2	6		S E 2	Cloſe.
	19		5	29		Small Rain.
	23		4	35		Cloſe. Much Rain in the Night.
18	8	2. 3	1	41	W S 2	Cloſe.
19	9		6 3	34	S W 2	Cloudy.
20	9	2	2	31	S 2	Cloudy. Rain laſt Night, Houſes yet dropping.
21	8	3	3	29	0	Cloſe.
	14	1. 3	3	27	N E 2	A very little Shower.
22	8	3.	6	27	N E 1	Cloſe a little, very little Snow in the Afternoon, *Mercury* riſing.
23	8	3. 5	10	26	1	Clouds.
	17	2. 7	10	20	S W 1	Cloſe.
24	8	3. 5	29 14	24	S W 1	Very fair, little Snow and Hail about 13, the *Mercury* falling a little.
25	8	2. 7	10	27	S W 2	Fair.
26	8	1. 6	2	35	3	Rain very little at Night.
	12		5		S W 4	Cloſe.
	18	1. 0	7	29	S W 2	Cloſe.
	24		7	34	1	Hard Rain, the *Mercury* a little fallen.
27	8	1. 0	7	37	W S 2	Cloſe.
	17	0. 2	2	33	W 1	Small Rain.
28	7	0. 7	12	33	W 1	Cloſe.
	16	0. 5	12	30	W 1	Fair.
29	8	1. 6	10	32	W. 1	Rain. Rain a great deal laſt Night.
	13		8	2	N 1	Cloſe, miſling Rain all this Morning till now.
	15		7		N 1	Cloſe.
	22	1. 6	5	31		Fair.
30	8	2.	1	32	W 2	Cloſe, Rain laſt Night.
	15		2		N W 3	Rain, as almoſt all this Morning.
	19		3		N W 3	Rain gently, as the great part of this Afternoon.
	24		6			Fair.
31	9	3. 1	6	29	N W 1	Fair.
	24		3			Cloſe, Rain in the following part of the Night.

APRIL, 1692.

D	H	Ther. 4.	Bar.	Hyg.	Wind		Weather. *April*, 1692.
1	9	2. 6	2	32	S	1	Small Rain.
	24		1				The greateſt part of the foregoing day gentle Rain.
2	9	1. 7	28.16	39	S E	2	Cloſe, Rain a great deal laſt Night, ſo as to make a Flood.
	16	1	17		S W	2	Fair.
	24		19				Cloſe, Rain in the following part of the Night.
3	9	2. 2	29. 0	23	N	2	Cloſe.
	14	1. 7	2	32	N W	3	Small Rain.
4	8	3. 4	10	30	N	2	Fair.
5	8	3. 2	19	26	N W	1	Cloudy.
	14	2. 1	19	26	N W	1	Rain, the *Mercury* a little riſen, the Rain laſted about an Hour.
	14	2. 1	19	26	S E	1	Rain.
	17	2. 1	19	26	S E	1	Rain.
6	8	3. 2	30. 3	27	N E	1	Cloudy.
7	8	3. 0	4	25	N	1	Fair.
	3		2	25			Cloſe.
8	8	2. 4	2	23	N E	1	Cloſe.
	24	1. 7	1	22			Cloſe.
9	8	2. 0	29.19		N E	1	A little Fog.
10	9	3	30. 0	21	N E	2	Fair, $\frac{13}{16} \mid 23\frac{16}{16}$.
11	8	4	2	17	N E	1	Not a Cloud, 16$\frac{15}{20}$.
12	8	2	1	12	N E	1	Scarce a Cloud, 15$\mid\frac{9}{14}$.
13	8	1. 4.	34. 0	7	N E	1	Not a Cloud.
	13	0. 2	29.19	3	E	1	Not a Cloud, but a thick Air called a red Wind.
14	8	1. 0	16	10	N E	1	High Clouds.
	23	0. 3	15	8			Clouds.
15	7	0 3	15	9	N E	1	Very Fair.
16	8	0	18	8	W	2	Very Fair.
17	9	0. 3	17	6	S W	2	Very Fair.
	23	0. 6	16	7			Small Rain for a little while.
18	19	0. 1	15	18	S W	2	Cloudy.

In the Cloſet on the North ſide of the Houſe.

D	H	Ther. 4.	Bar.	Hyg.	Wind.		Weather. *April* 1692.
18	15	0. 3	14	16	S W	2	Cloſe.
	23	0. 2	14	18			Rain.
19	9	1. 0	15	18			Fair.
	16	0. 5	15	16	SW	3	Cloſe.
20	9	0.---2	15	16	W	1	Fair.
	9	0	6	18	S W	2	Cloſe, a little Rain this Morning.
21	23	0. 4	1	27		2	Rain, as it had been moſt part of the Day,
22	8	1. 1	29. 0	17			
30	24	2. 3	4	21	N E	3	Rain, and all the day before Rain.

M A Y. 1692.

D	H	Ther.	Bar.	Hyg.	Wind.		Weather.
1	10	2. 2	8	29	N E	2	Cloudy,

In the Chamber, on the South ſide of the Houſe.

D	H	Ther.	Bar.	Hyg.	Wind.		Weather.
2	8	2. 1	12	29	N W	2	Cloudy, Rain laſt night, the *Mercury* was at 23 laſt night as now.
	18	3	11	27		1	Fair, 2 or 3 Showers ſince 8.
3	9	2	14	29	N E	1	Fair.
4	11	1	14	26	N W	1	Fair.
5	8	2. 6	16	23	N W	2	Cloſe.
6	8	6	16	24	N W	1	Fog.
7	8	0. 2	14	21	W	1	Fair.
	19		13				Rain.
8	9	0 —— 3	17	16	N E	1	Cloudy.
9	8	0_2 —— 1	19	13	N E	1	Fair.
10	7	2 2	19	12	N E	2	Fair
13	17	0 ——	19	5	N E	2	Fair.
14	10	1. 0	19	12	N E	2	Fair.
15	9	0 —— 2	19	12	N E	1	Rain a little.
	16	0 —— 4	19	13	N E	1	A few Drops, the *Mercury* ſunk a very little.
16	7	0	17	13	E	1	Fair.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather. *May*, 1692.
17	8	$0\,\underline{\quad}^{4}$	29. 14	8	N E 1	Not a Cloud.
18	7	$0\,\underline{\quad}^{6}$	29. 12	5	S 1	Clouds, a little Shower about 10
19	9	$0\,\underline{\quad}^{5}$	12	6	W 2	Cloudy, *i. e.* more Clouds than clear Sky.
20	9	3	10	5	S E 1	Cloudy.

N. B. Cloudy ſignifies more of the Sky cover'd than clear. *Fair* ſignifies more open Sky than cover'd with Clouds.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.
21	9	0	9	6	S W 1	Cloudy.
	18	0	9	5	S W 1	Rain for about an Hour.
22	8	0.	12	6	N E 1	Cloſe, *i. e.* the Sky no where to be ſeen for Clouds, a ſhower about 17.
23	6	$0\,\overline{\quad}_{2}$	18	7	W 1	Fair, *i. e.* more Sky than Clouds.
	9	2	18	8	S W 1	Very Fair.
	15	$^{1}_{0}\,\overline{\quad}$	18	7	W N 2	Hard Rain about ¼ of an Hour.
	17	1. 1	18	7	S W 2	Hard Rain.
24	7	$0\,\overline{\quad}_{4}$	17	8	N E 1	
25	8	5	14	8	S E 1	
26	8	1 1	10	6	E N 1	
	18	3	10½	8	N E 2	Cloſe, a Thunder Shower at 19, the *Mercury* being riſen to 11.
27	7	7	12	7	N E 2	Cloſe.
28	7	$0\,\overline{\quad}_{1}$	14	7	N E 2	Cloudy.
	12	$0\,\underline{\quad}^{7}$	14	9	N E 2	Cloudy.
29	8	1. 1	13	10	W 2	Cloudy.
	13	1. 3	13	10	W 2	Rain.
30	6	$0\,\overline{\quad}_{2}$	15	8	W S 1	Cloſe.
	11	0 —	13	8	S W 3	Rain till night.
	14	$0\,\underline{\quad}^{1}$	11	9	S W 3	Rain.
	21	3	3	14	3	Rain hard.
	24	3	29.	17	4	Cloſe.
31	7	$0\,\overline{\quad}_{3}$	1	14	W 4	Cloudy.
	24		2		W 4	Cloudy.
	24	1	4	12	2	Fair.

JUNE, 1692.

D	H	Ther. 4	Bar.	Hyg.	Wind.		Weather. *June*, 1692.
1	7	0. —— 4	6	12	W	3	Fair.
2	7	0.	4	13	W	2	Cloudy.
	10	0. —— 1	4	13	W	4	A ſhower for about ½ an hour, and then fair and calm again, at 11 Rain again, the *Mercury* a little raiſed. Several Showers in this Day.
3	8	0 —— ½	13	14	W	1	Cloſe.
	9	0	14	14	W	1	Rain a little.
4	6	0	14	13	S	1	Fair.
	23	0. —— 7	7	13		1	Cloſe.
5	9	0. —— 5	4½	13	S W	3	Cloudy.
	12	0 —— 6	4	14	S W	2	Hard Rain ¼ hour, ſeveral ſuch Showers this Afternoon.
6	7	0 —— 5	29. 5	14	S W	1	Cloudy.
	10	0 —— 3	5	14	S W	2	Hard Rain ¼ Hour.
7	7	0 —— 3	6	13	S E	2	Betwixt Cloudy and Fair.
	11	0 —— 1	6	13	S E	2	Hard Rain ¼ Hour, and a very great Shower 1 Hour, *Mercury* ſtanding as it was.
8	8	0 —— 4	7	13	0		Fair.
9	9	0 —— 1	6½	15	W S	1	Rain a good part of laſt night, and all this morning.
	24	0 —— 6	11	18		2	Rain all the Afternoon tlll 20 or 21, the *Mercury* all the while riſing, now cloſe.
10	9	0 —— 4	12	18		0	Cloſe, Rain the paſt Morning.
11	9	0	13	19	S W	2	Cloudy.
	11	0 —— 3	14	19	S W	2	Rain ½ Hour.
12	9	0 —— 1	17	17	S W	2	Very Cloudy.
13	8	0	17	19	W	1	Cloudy.
14	8	1. 1	16		W	1	Cloudy.
15	7	1. 0	15	18	N	1	Very Fair.

In my abſence, the Thermoſcope being obſerved, it was found from the 15th of *June* to the 11th of *Auguſt*, never to get ſo high as 3, and was very often below Temperate, ſo cold was this Summer.

AUGUST, 1692.

D	H	Ther. 4.	Bar.	Hyg.	Wind	Weather. *Auguſt*, 1692.
13	19	2. 6	29. 10			Cloudy, Rain about 21.
14	9	1. 5	29. 10		S W 2	Cloudy.
	11	1. 6	29. 10	17	S W 2	Rain.
	23	1. 0	12	17		Fair.
15	9	1. 2	8	25	E 2	Cloudy, Rain laſt night.
	12	1. 5	7	26	S E 2	Rain.
16	8	0——^{5}	12	25	W 2	Fair.
17	S	0——^{2}	15	21	S E 1	Fair.
18	7	1. 1	14	22	S W 1	Cloudy.
	24	2. 1	13	22		Small miſty Rain.
19	9	1. 4	15	22	W 2	Cloſe.
20	8	1. 1	18	20	S W 1	Very Cloudy.
21	8	1. 0	16	19	S 1	Fair.
	10	1. 3	16	19	W 1	Very ſmall Rain.
	12	1. 5	16		W 1	Very Cloudy.
22	8	1. 6	18	18	N W 2	Fair.
23	9	0——^{5}	30. 0	16	S W 1	Not a Cloud.
24	8	0——^{3}	30. 0	15	0	Not a Cloud.
25	8	1. 1	29. 19	15	S W 1	Not a Cloud.
26	8	1. 2	16		S E 1	Not a Cloud, *Mercury* gently ſinking ever ſince Yeſterday Morning.
	17	3. 5	16		1	Fair.
27	7	1. 5	14	12		Thick Fog.
28	8	1. 1	29. 16	12	N W 2	Very Fair.
29	9	0——^{7}	16	10	N W 1 rac. S E	Very Cloudy.
	17	1. 3	15	12	0	Cloſe, ſome ſmall drops.
30	8	0——^{5}	13	12	N W 2	Cloſe.
	20	1. 0	12	13	N E 1	A little Rain.
31	8	0——^{2}	13	12	N W 1	Very Fair.

SEPTEMBER. 1692.

D	H	Ther. 4.	Bar.	Hyg.	Wind.	Weather. *September* 1692.
1	9	1. 0	11	13	S W 3	Cloudy.
	12	1. 3	11	13	S W 3	A little Rain.
	14	1. 4	11	13	S W 2	Hard Rain for 1 Hour, and ſoft till 17.
2	3	0 2	14	11	W 2	Fair.
3	9	0 6	14	10	W 2	Cloudy.
4	8	2. 0	15	8		
5	8	1. 6	16			Very Fair.

OCTOBER. 1692.

18	22	0 6	29. 11		W 2	
19	9	0 5	4		S 3	Rain.
20	9	1. 2	5		S W 2	Very Fair.
	18	0 3	2	16	S W 4	Rain.
21	9	1. 4	10	17	W N 2	Not a Cloud.
	24	0 5	15	16		Rain.
22		0	16	37	W S 3	Cloudy.
	16	0 3	17	33	W S 2	Cloudy.
23	9	0 3	17	33	S W 1	Cloudy.
	15	0 3	16	24	S W 1	Fair.
24	9	0 5	15	27	S W 2	Fair.
	14	0 1	16	30	S W 1	Small Miſt.
25	8	0 5	30	30	W 2	Cloſe.
	15	0 3	29. 19	29	W 2	Scarce a Cloud.
26	9	0 5	16	28	W 1	Cloudy.
27	9	1 1	13	27	W 1	Cloſe.
	23	0 7	13	27	1	Cloſe, a little miſling Rain good part of the Afternoon.
28	9	1. 0	15	28	N W 1	Cloudy.
29	9	1. 1	17	28	E 1	Cloſe, a little Fog.
		0 7	18	29	E 1	Cloſe, a little gentle Rain about 15.
30	9	2. 1	30. 1	26	E 2	Cloudy.
31	8	3. 0	29. 19	18	N E 1	Fair.

D	H	Ther. 4	Bar.	Hyg.	Wind	Weather. *October*, 1692.
	11	2. 6	18	19	N E 1	Hard Snow, which laſted till paſt Midnight.

NOVEMBER, 1692.

1	9	3. 5	29. 9	19	N E 1	Fair, ſcarce a Cloud.
2	11	4. 0	7	20	S W 1	Rime and Froſt.
	15	3. 6	7	20	S W 1	Snow, which began at 13, and laſted to 20.
3	9	3. 5	7	23	W 1	Cloſe.
	12	3. 0	5	25	W S 1	Rain, which began at 11, and laſted till 17.
	24	2. 0	1	39	3	Cloſe, Rain before One, and ſo the greateſt part of the Night.
4	9	1. 5	3	40	S 2	Cloſe.
5	9	1. 4	13	36	N E 1	Cloſe, Rain laſt night.
6	9	2. 0	15	33	N E 1	Cloſe.
7	8	2. 2	16	32	N E 0	Cloſe.
8	9	2. 1	14	32	E N 1	Cloſe.
	16	2. 0	14	33	N E 1	Rain, which began at 14, and continued till 24.
9	9	2. 2	13	33	N 2	Small Rain for a very little while.
10	9	2. 4	17	32	N W 1	Not a Cloud.
11	9	2. 4	17	30	W 1	A little Fog.
	16	1. 6	14	32		Hard Rain.
12	9	1. 5	10	33	W 1	Rain.
13	9	3. 1	4	30	W 0	Fair, Froſt.
14	9	4. 2	12	28	N W 2	Very fair, hard Froſt.
15	9	4. 6	16	26	W 0	Very fair, hard Froſt.
16	10	4. 1	8	31	S 3	Cloſe, Snow laſt night from eleven, the greateſt part of this Day.
17	9	3. 7	8	34	S 1	Very Cloudy.
	13	3. 0	6	35	S W 2	Rain.
18	8	4. 0	10	37	0	Fog, in the Cloſet on the North ſide of the Houſe.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather. *November*, 1692.
26	22	4. 2	18		3	Cloſe, in the Cloſet on the North ſide of the Honſe.
27	10	4. 4	16	34	E 2	Cloudy.
28	9	4. 6	18	32	E 3	Fair, Froſt.
29	9	4. 6	16	31	E 3	Cloſe, Froſt.
30	9	4. 5	18	33	E 3	Cloudy, Froſt.

DECEMBER.

D	H	Ther.	Bar.	Hyg.	Wind.	Weather.
1	9	4. 5	30. 0	33	E 2	Rain mixed with Hail, the Rain as it fell Froze, and continued miſling till 14 or 15.
2	9	4. 1	30. 0	38	S E 2	Rain, which began laſt night, and laſted all this Day.
	17	3. 4	29.17	39		Fog.
3	9	3. 6	19	45	S W 0	Thick Fog, Froſt.
4	9	2. 6	5	48	S 2	Rain all the Morning.
	12	2. 3	3	49	S W 2	Cloudy.
5	10	2. 4	5	54	S W 2	Cloudy.
6	11	2	7	53	W 2	Cloudy, ſome Rain this Morning.
7	9	3	2	54	W 2	Cloſe.
8	9	1 4	28 18	56	S W 4	Rain and Stormy, Wind all this Day.
	23	0	15	58	S W 4	Hard Rain.
9	9	4	16	55	S W 3	Cloudy.
	17	5	15	53	3	Hard Rain.
	24	2. 1	15	52	3	Fair.
10	10	2. 4	29. 1	52	S W	Very Cloudy.
	24	3. 1	11	52	0	Very Fair.
11	9	3. 4	13	53	W 0	Very Fair.
	18	2	13	52	E 1	Very Fair.
12	10	3. 0	10	54	S 2	Cloſe.
	15	2. 6	6	53	S E 3	Rain a little and ſhort.
13	9	3	4	54	S E	Cloſe.
14	9	1. 6	5	56	S 2	Rain all day.
	18	1. 4	3	57	2	Rain yet.
15	9	2. 0	11	56	W 1	Very Fair.
	15	1	13	56	W 1	Thick Fog.
16	9	4	11	54	S 2	Cloſe.
	15	2 0	11	57	S W 2	Rain from 12.
17	9	1. 6	14	56	S W 1	Cloudy.

In my Chamber on the South ſide of the Houſe.

D	H	Ther.	Bar.	Hyg.	Wind.		Weather. *December* 1692.
		4.					
	11	1.	15	54	W N	1	Fair.
	17	4	17	49	W N	1	Fair.
18	10	2. 7	30. 3	43	E	0	Very Fair, hoar Froſt.
19	9	3. 2	0	43	S	0	Miſt. A Miſt is when the drops manifeſtly fall.
20	8	2. 6	29.17	45	N E	0	Miſt, as it was all day yeſterday.
21	9	4	12	46	S W	2	Cloſe.
	19	1	4	48	S W	3	Rain.
22	9	1	6	48	S	1	Not a Cloud.
	24	5	0	42		3	Rain.
23	9	3	28.10	51	W	4	Rain, which had been all night.
24	10	3 2	19	45	W	1	Cloſe.
25	11	3. 3	29.12	40	W	1	Fair, Froſt.
26	9	2. 0	3	57	S W	3	Rain all laſt night.
27	9	6	3	51	S	3	Cloſe.
	11	2	0	51	S W	4	Cloſe.
	12	1	28.19	51	S W	4	Rain all day.
28	11	3. 2	18	48	S W	2	Rain.
29	9	6	29. 6	48	S	1	Fair Froſt.
	24	2	28.19	47	S	4	Rain.
30	9	2. 3	11	57	W	4	Rain very hard all laſt night till now.
	24	3	17	48		4	Fair.
31	9	6	15	46	W	4	Not a Cloud.
	20	5	29.8	39		2	Rain.
	24	4	10	40		1	Cloudy.

A

VIII. The firſt Table ſhews how many Pounds, and Centeſimals of a Pound *Troy* of Rain, fell at *Townley* in *Lancaſhire*, and at *Upminſter* in *Eſſex* in each Month of the Years 1699, *&c.* with the Quantity and Depth every Year.

Obſervations on the Weather, for ſome Years paſt, by Mr. D ham, *n.* 285. *p.* 1443.

The Second Table ſhews the Height of the ☿ at *Townley* and *Upminſter*, on the firſt Day of every Month in the Year 1702. three times a Day, *viz.* about 7 in the Morning, and at 9 at Night; and about 3 Afternoon at *Townley*, with the Difference of the ☿'s Variation, and its Difference between both Places.

The Third Table ſhews the *loweſt Stations* of the ☿ in the Year 1702. at *Townley* and *Upminſter*; with the Difference of the ☿ at both Places.

	1699.				1700				1701				1702			
	Townl.		Upmr.		Townl.		Upmr.		Townl.		Upmr.		Townl.		Upmr.	
January	17	91	8	91	20	84	3	91	22	41	14	96	21	10	9	81
Febru.	32	70	60	5	19	12	7	64	16	78	8	78	21	27	7	30
March	17	92	5	63	7	58	1	55	7	10	3	91	2	48	2	37
April	10	47	3	44	18	65	7	60	6	11	1	43	5	34	10	90
May	4	00	2	67	17	92	6	91	19	67	9	11	8	81	6	49
June	10	37		40	13	15	7	60	11	34	5	79	23	00	13	46
July	16	51	6	36	15	26	4	24	17	58	9	49	25	31	4	39
Auguſt	19	77	8	57	12	05	8	14	23	66	6	57	20	12	6	88
Septem.	16	53	8	06	23	52	14	85	21	30	5	63	23	1	8	05
October	18	90	13	49	26	44	17	15	24	59	10	21	28	57	7	92
Novemb.	14	65	1	91	13	69	5	24	25	60	8	22	37	11	14	05
Decemb	16	78	5	77	26	88	10	30	10	19	9	35	41	63	10	27
Total	196	51	75	55	215	30	95	13	206	33	93	45	257	75	101	89
Depth	39	302	15	110	43	060	19	026	41	266	18	690	51	55	20	378

First D. of Mo.	☿ Heigt. at Town	☿ Heig. at Upr.	D. dif. at Tow.	D. dif. at Tow.	☿ low. at Town.
	29 06	29 28			22
Jan.	28 90	21	16	07	31
	58	10	32	11	52
	29 58	96			38
Feb.	40	91	18	05	51
	30	80	10	11	50
	36	68			32
Mar.	36	66	00	02	30
	40	58	04	08	18
	70	79			09
April.	68	73	02	c6	05
	69	79	01	06	10
	20	51			31
May		49		02	
	09	44	11	05	35
	56	78			22
June					
	61	82	05	04	21

First D. of Mo.	☿ Heigh at Tow.	☿ Heig. at Upr.	D. dif. at Tow.	D. dif. at Upr.	☿ low. at Town.
	84	98			14
July	90	30 01	06	03	11
	92	11	02	01	19
	62	29 80			18
Aug.	49	74	13	06	25
	47	67	02	07	20
	92	30 09			17
Sept.	95	12	03	03	17
	95	11	00	01	16
	56	29 74			18
Octo.		76		02	
	54	75	02	01	21
	46	71			25
Nov.	50	75	04	01	25
	58	76	08	01	18
	35	50			15
Dec.		34		16	
	10	09	25	25	01

D. of Mo.	☿ at Town	☿ at Up.	Differ.
	29 15	29 50	35
Feb. 3	28 50	16	66
	27 50	20 43	93
		05	
4	39	05	66
		62	
	77	18	31
Dec. 23	71	12	41
	90	10	35
		25	

High. Stations of ☿ An. 1702.

	Upm.	Town.	
	30 25	29 95	30
Ja. 30	25	95	30
	19	83	36
	33	30 02	31
Mar. 12	35	05	30
	32	07	25
	07	29 94	13
Oct. 21	18	99	19
	22	30 00	22

More ſettled Stat. An. 1702.

	Town.	Upmr.	
	30 04	30 13	09
April 7	00	15	15
	02	16	14

D. of Mo.	☿ at Tow.	☿ at Up.	Differ.
	30 03	30 16	13
Apr. 28	01		
	29 99	15	16
	98	15	17
29	93	13	20
	86	06	20
	78	29 89	11
May 13	72	87	15
	74	87	13
	30	68	38
June 10	40	71	31
	44	70	26
	50	70	20
11	51	72	21
	59	70	11
	45	86	41
Aug. 30	57	86	29
	59	88	29
	73	91	18
Sept. 27	72	91	19
	73	91	18
	74	91	17
28	78	95	17
	73	93	20

As to the moſt remarkable Weather, eſpecially Rain of laſt Year, and the Effects thereof: Mr. *Towneley* tells me, that it is a general Complaint in the North of *England*, that there were but ſmall Crops of Hay, which Calamity befel the Southern parts alſo; the Cauſe whereof may be perceiv'd by the foregoing firſt Table of Monthly Rain; in which you may perceive the growing Months of *March* and *April* to have been dry Months in *Lancaſhire*, and *May* no wet Month, conſidering the Quantities of the other Months, and of other Years. Here at *Upminſter*, *April* was unfortunately a wet Month, till the 23d, or elſe no doubt, we ſhould have ſuffered more than we did in the want of Hay; for the growing Month of *March* was a dry Month, by the Table; and *May* (which by the ſame Table ſeemeth to have had near a due quantity of Rain) was a very dry Month by the Tables ſent to Dr. *Sloane*; for it appears by them, that very little Rain fell from *April* 23, till *May* 29, and then fell in great Showers, the greateſt quantity of that Months Rain. Mr. *Towneley* doth not tell me Particulars, but I gueſs it to be after this manner with them in the North of *England*; for beſides, that *March* and *April* were dry Months with them, and *May* ſomewhat more wet, yet probably the wet of *May* did not fall early in *May*; for it appears by Table the third, that the Mercury was high, and in ſomewhat a fixed Station on *May* 13. As to the other Months, there is little remarkable, beſides the vaſt Diſproportions of Rain between *Lancaſhire* and *Eſſex*, which I ſhould ſcarce take notice of, if it was not what happeneth almoſt every Year, as will appear by the firſt Table. The Cauſe of this I cannot judge of, unleſs it be that *Lancaſhire* is a more Hilly Country than *Eſſex*, which ſort of Lands, as they more need wet than Vales and low plain Countries do, ſo have greater Shares of it than theſe have: beſides, ſomething may perhaps be attributed to the Weſtern Situation of *Lancaſhire* near the Sea; from which Quarter the Winds in *England* blow more than from the Eaſtward.

At the Foot of the Table of Rain, beſides the quantity which fell in each Year, I have added the depth thereof in Inches; or what depth it would have been of, if the Earth had not imbib'd it, but it had ſtagnated on the ſurface thereof; I have added two Tables more, of the Stations of the *Mercury* in the *Barometer* at *Towneley* in *Lancaſhire*, and at *Upminſter* in *Eſſex*, with the Differences thereof; and this obſerved at three times of the Day, *viz.* in the Morning, and about three in the Afternoon at *Towneley*, but at Noon at *Upminſter*, and at nine a Clock at Night. One Table to the firſt Day of every Month; the other the moſt remarkably low, high, and more ſettled Stations of the *Mercury* the laſt Year 1702. By theſe *Barometrical* Tables, it may be ſeen whether at all, or how far conſentaneous to Truth, that Opinion is of ſome both in *England* and Abroad, *viz.* *That the* Mercury *aſcendeth and deſcendeth in all places at the ſame time, and in the ſame proportion.* It is manifeſt, that the *Mercury* doth commonly riſe and fall in one far diſtant place, when it doth ſo in another, but not alike: Alſo when any conſiderable Variation is in one place, it is ſo in another; when remarkably high, remarkably high; when low, low; when a great aſcent or deſcent, generally the ſame elſewhere; but only the Differences of all theſe are not in equal proportion in all Places; all which ſeemeth reaſonable to be expected, by reaſon of the Difference of Weather in different places, eſpecially as to wet and dry.

There is one thing in the third Table, which I think deſerveth eſpecial Remark, becauſe I believe it to be the moſt conſiderable Alteration of the *Mercury*, that hath ever happened ſince the Invention of the *Baroſcope*, and that was the deſcent on *February* 3d and 4th laſt: Concerning which, Mr. *Towneley* in a former Letter gives me this Account, " That on *February* 3d the *Mercury* was at three in the Morning at 29. " 15. at 3 h. 28. 50. and 10 at Night at 27. 5. The next Day it fell " yet lower, and about 12 was at the loweſt, *viz.* 27. 39. but for an hour " before and as much after, it varied only ſo much as to make it ſenſible " that it was fallen and began to riſe again; the loweſt he had ever ſeen " it before was on *November* 18. 1674. when it fell to 27. 63. That " Mr. *Flamſteed* at the Obſervatory obſerv'd as remarkable a deſcent of " his *Mercury*; and that it happened about the ſame time of the Day, " *viz.* 2 of the Clock in the Afternoon at both Places. And laſtly, he tells me, " That the deſcent in *February* laſt was the greateſt that has " been ſince the filling his Tube, which was in *March* 1665. The particulars which I obſerved here at *Upminſter* about that deſcent were, That on *February* 12, the *Mercury* was high, *viz.* 29. 80. the next Morning 29. 50. at Noon 29. 16. at Night 28. 43. the next Morning, (*viz. Feb.* 4.) at 7 of the Clock it was fallen to 28. 5. and was globoſe, as if it had riſen or was inclined to riſe; but it continued in the ſame Station till after Noon, and then began to riſe about 2 of the Clock, and roſe haſtily. The Weather accompanying was fair on *Feb.* 3. in the Morning, Hazy at Noon, and Rain at Night, and a violent Tempeſt in the Night, and all the next Morning, of *Feb.* 4.

VIII. *A Proſpect of the* Weather, Winds, *and* Height of the Mercury *in the* Barometer, *on the firſt day of the Month; and of the whole Rain in every Month in the Year* 1703. *and the beginning of* 1704.

Mon.	Weather at *Towneley.*	Weather at *Upminſter.*	Winds at *Towneley.*	Winds at *Upminſter.*	Baro. at Tow.	Baro. at *Upm.*	Rain at *Towneley.*	Rain at *Upminſt.*
			S E 5	S E 1	29 04	29 39		
Jan.	Overcaſt.	Overcaſt.			28 91	35	15 17	8 89
					80	22		
		Froſt	S S E 3	E 1	29 29	62		
Feb.	Overcaſt.	and		Clouds. S	37		15 88	6 41
		Fair.			47	68		
		Froſt, and	W S W	N W 1	64	82		
Mar.	Chequer'd.	Fair.	N E		67	83	20 02	4 75
				1				Snow

Mon.	Weather at *Towneley.*	Weather at *Upminſter.*	Winds at *Townley.*	Winds at *Upminſter.*	Bar. at *Town.*	Baro. at *Upminſt.*	Rain at *Towneley.*	Rain at *Upminſter*
		Snow.			29 73	29 92		
	Chequer'd	Fair.		W S W 1	59	93		
Apr.	and	Cloudy.	W	W 4	59	91	17 63	12 49
	Cloudy.	Fair.			55	91		
			N N E	N b W 3	49	66		
		Cloudy.		N W b N 3	00	70	17 64	20 77
May.	Cloudy.	Thunder, with Hail and Rain			60	75		
			S	S 0	38	61		
		Cloudy.		S 1	49	75	24 06	14 55
Jun.	Cloudy.	Clear.			63	88		
			S S E. S E	E 1	84	99		
July.	Cloudy.	Fair.	E 1	N b E 2	80	96	3 65	14 90
					77	90		
		Thunder	S E 1	N 2	57	72		
Aug.	Cloudy.	and Rain.	4	N by W 2	55	72	14 21	3 36
		Fairer.	4	Clouds S E	58	69		
			E	N W 1	80	30		
Sept.	Clear	Cloudy.		W N W 1	00	40	32 40	14
	Chequer'd.	Fairer.			18	40		
			N	N N W 4	28 76	87		
Oct.	Chequer'd.	Fair.			83		7 04	9 55
					86	30 08		
			E	N b E 1	29 56	29 72		
Nov.	Overcaſt.	Cloudy.			51		28 56	7 27
					52	69		
			W		36			
Dec.	Overcaſt.	Overcaſt.	3		45		10 24	2 14
	Cloudy.	Rain.			48	81	196 60	119 94
			S S E	E 0	80	30 07	31 39	4 06
Jan.	Overcaſt.	Overcaſt.	S E 2	S E b E 1	82	10		
					85	10		
		Miſſing.	W	N W b N 1	90	23	5 93	2 19
Feb.	Overcaſt.	Cloudy.			02	26		
					02	26		
Mar.	Overcaſt.	Overcaſt.	S	S E b E 0	29 11	29 58	20 78	16 04
		Fairer.		S E 1		45		
	Cloudy	Rainwith	W 4	S b W 4		40		
Apr.	and	Hail.	N W 7	Clouds	28 72	17		
	Chequer'd.	Fair.		S W by W	94	18		
					07	38		

Remarks on the above Tables; by Mr. Derham *n.*297. *p.*1887.

From hence it appears, 1. That (as I have before obſerved) every Year much more Rain falls at *Towneley* than *Upminſter.* I have an Extract of the Rain at *Paris* and *Liſle*, as far as the *French* have publiſh'd their Obſervations. And I find there is about twice as much Rain falls at *Towneley*, as doth either at *Upminſter*, *Paris*, or *Liſle*. Mr. *Towneley* hath formerly obſerved in one of the Tranſactions, that as much more Rain falleth at *Towneley* as *Paris*. And Mr. *de la Hire* obſerves, That more Rain falleth at *Liſle* than *Paris*. But *Towneley* doth far exceed, as hath been ſaid, and will appear by Particulars. At *Liſle*, one Year with another, the Depth of the Rains amount to 22 Inches 3 Lines, *Paris* Meaſure, or 23 in 3 *l.* which make about 23 ½ Inches *Engliſh*, or 24 ½. At *Paris*, one Year with another, they amount to 20 Inches 3 ½ Lines *Paris* Meaſure, which is near 23 Inches *Engliſh*. But at *Towneley*, one Year with another, according to Mr. *Towneley's* Computation formerly, the Rains amount to above 41 Inches depth. And by taking eight other Years, in which the Rain was obſerved both at *Towneley* and *Upminſter* (*viz.* from 1696. to 1704.) I find that all the 8 Years Rain at *Towneley* amounteth to above 1700 *l. Troy*, at *Upminſter* 823 *l.* only; which ſaid Sums being divided by 8, give 212 *l.* ½, one Year with another, at *Towneley*, and near 103 *l.* at *Upminſter*. Each of which Sums being doubled, and making a Decimal Fraction of the laſt Figure, doth nearly give the number of Inches, which all the Rain would have riſen to, if the Earth had not ſwallowed it up, *viz.* 42½ Inches at *Towneley*, and about 20 ½ Inches at *Upminſter*. Wherefore the Rain at *Upminſter* is leſs than at *Paris*, at *Paris* than at *Liſle*, and at every one of the Places leſs than at *Towneley* by much. The reaſon of which vaſt ſurmount at *Towneley*, is doubtleſs from the height of the Hills thereabouts, which retard or ſtop the Weſterly Clouds: From which Point the Winds blow more than any other here in *England*.

2. Notwithſtanding the great Diſproportion of Rain between one place and another, yet there is a great Agreement between our Barometers; one riſing or falling when the other doth; and that much, or little, as the other doth, although not always exactly in the ſame Proportion. And this is what I find Monſieur *Maraldi* hath obſerved, by comparing his Obſervations at *Paris* with mine at *Upminſter*, in the Years 1697 and 1698. Only at *Paris* the *Mercury* is commonly 3 or 4 Lines lower than at *Upminſter*. And ſo it appears to be at *Towneley*, from this and ſome other Tables, *viz.* 3 or 4 tenths of an Inch lower at *Towneley* than at *Upminſter*. Which is an Argument that *Towneley* and *Paris* are ſituated higher above the ſurface of the Sea than *Upminſter* (which is nearly in the ſame Level with *London*) is.

3. Another thing ſhown by the foregoing Table is, That there is ſome Agreement between the Winds at *Towneley* and *Upminſter*. Which although not always exactly in the ſame Point, yet do often tend the ſame way; blowing within a Point or two perhaps of the ſame Courſe; eſpecially when the Wind is ſomewhat ſtrong. Or if the Winds have

differ'd, yet the Current of the Clouds hath commonly ſhew'd the Motion of the upper Air to agree thereto.

This happens often, but not always, and Monſuer *Moraldi* has obſerv'd it at *Paris* in the aforeſaid Years. *Vid. Hiſt. Acad. Sc. Anno* 1699.

IX. *Weather* &c. *at* Upminſter *in* 1705. *by* Mr. Derham, *n.* 309. *p.* 2318.

JANUARIUS. 7 . . . 12 . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluviæ.	
	Gelu.	Nb W o		30	14	79		
5	Apricum.	1	NE		17	90		
	Nubilum.				16	87		
	Gelu cum	W o			21	82		
10	Aere craſſo.	EbS o			22	93		
					25	87		
	Gelu ſævum	WbN 1			00	74		
15	& nubilum.	SW o		29	97	85		
	Regelat.				93	95		
	Gelu & Dies	E 1		30	03	73		
20	apricus.	EbS 1			06	96		
					13	82		
	Nebula.	EbS 1		29	79	92	o	36
25	Clarius.	ESE 1			80	103		
	Nubilum.				81	92		
	Nubilum.	N 1	NbE	30	03	87		1.
30	Ningit.	NbE 1			02	97	1	11
	Nubilum.			29	99	90		

FEBRUARIUS. 7 . . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
		S 2		28	89	98		
5	Pluviæ.	SEbS 2			77	102		
					78	93	2	68
	Apricum.	SSE 1	SWbS	29	85	97		
10	Nebuloſum.	S 5			81	115		
	Pluvia.				66	107		
	Gelu. Apri-	NbW o		30	39	84		
15	citas cum te-							
	nui nebula.				31	88		
	Nebuloſum.	EbN 2			03	92		
20				29	97	100		
	Nubiloſum				86	95		
	Geloſum.	SbE 1	SSW.		28	81		
25	Apricum.	S 2			27	115		
	Pluvioſum.				19	95		1.
					Sum. Pluviæ		5	53

MARTIUS 6..12..9

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
	Nebulum.	N N E 3	N E	29 61	94	
5						
	Serenum.			65	90	
	Gelu.	S 0	W b N	41	86	
10	Apricum.	E N E 1		40	112	
	Nubilum.			40	90	
		E 1	S	24	94	
15	Pluvia.					
				17	105	
	Caliginoſu.	N b E 2		65	88	
20	cum Imbribus					
	nivoſis.					
	Clarius, cu.	N b W 2		21	83	
25	guttulis ni-			33	104	
	voſis.			48	81	
	Turbidum	S b W 3		35	116	
30	& pluvio-	S W 8		30	127	1.
	ſum.			22	108	5 55

APRILIS. 5....12..9

	Cœlum.	Ventus.	Nubes.	Barom.	Th.	Pluvia.
	Nubiloſum.	W S W 1		29 72	102	
5	Turbidum.	S W 5		70	122	
	Guttæ.			66	120	
		E b N 1	S b W	34	98	
10	Pluvioſum.			32	117	
				25	106	
	Gelu cum	N 0		82	79	
15	Apricitate.			90	116	
	Nubilum.			96	98	
	Nubiloſum.	W b S 1		91	101	
20		W 2		92	134	
	Placidius.			85	120	
	Pruina. To-	W 0	N b W	70	85	
25	nitru cum	1	N b W	80	125	
	Grand. pluv.			87	117	
	Sudum	W b N 1		68	100	
30	&					1.
	Calidum.			73	109	5 15.

MAIUS. 5 . . . 12. 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
		S W b S 1		29	61	115		
5	Dies nubiloſus.	S b W 3			56	150		
					55	120		
	Nubilum.	S S W 1	N W	30	07	104		
10		W b N 2			05	142		
	Apricum.			29	98	124		
	Imbres	NW b N 2			80	92		
15	Grandinis							
	& Pluviæ.				95	97	0	22
	Nubilum.	N 1			78	106		
20		N b E 2			78	124		
	Apricum.				80	113		
	Nubilum &	N b E 2	N N E		85	93		
25	Frigidum.	N 2			91	120		
	Clarius.				96	101		
	Nubilum	W b N 1			71	98		
30	&							1.
	Frigidum.				85	99	2.	03

JUNIUS. 5 . . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
	Nubilum	S W 1	W	29	62	119		
5	& Calidum.	N N W 1	W N W		65	143		
	Guttæ.				64	126		
	Apricum	E S E 2	S E b S	30	03	110		
10	cum Calore.	E b S 2			01	153		
	Nubil. Pluv.			29	94	126	0	30
	Nebula.	W b S 1			92	127		
15	Apricitas	2			92	152		
	fervida.				93	132		
	Nubilum.	E 1			95	125		
20	Fervidum.							
	Minus fervi.				94	125		
	Nubilum.	S W b W 2			62	137		
25	Guttæ.	W 3			59	151		
	Imber.				50	131	0	08
	Nebula.	N 0			84	106		
30	Apricitas.	W 1			92	156		1.
	Fervida.				94	134	3	29

JULIUS 5 . . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
	Apricum.	W 0	N W	30	08	122		
5	Pluvia.	N W 2			08	139		
	Pluvia.				10	116	0	82
	Nubilum.	N b W 3		29	79	112		
10	Imber & minus calidum	5			88	120		
				30	00	118		
	Apricum.	E b S 0		29	96	112		
15	Fervor æſtuoſus.	S 2	N		93	163		
					90	145		
	Apricitas.	S W b W 0		30	03	115		
20	cum fervore.	N N W 2			03	164		
	Nubilum.				03	136		
	Nunc Apricum: Nunc	W b S 0		29	72	110		
25		S b W 3	W		69	170		
	Nubilum.				66	148		
	Apricum.	W b S 1			79	116		
30	Nubilum.	S W 2			82	151		1.
	Minus nubi.				82	135		
							5	56

AUGUSTUS 5 . . . . .12 . . .9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
	Nubilum.	W S W 1	W	29	82	133		
5	Minus Nubilum.	W b N 1			86	158		
					86	148		
	Apricitas	S S W 3	S W		48	131		
10	Ventoſa.	S W 6			56	158	1	00
	Nubiloſum.				44	138		
	Turbidum.	S W 0			97	109		
15	Nubiloſum.	S S W 1			94	153		
					82	132		
	Apricum.	S 1	S W		61	120		
20	Guttæ.							
	Minusnubil.				65	129		
	Apricum.	W 1	N W		34	105		
25	Guttæ.	W N W 6			42	128		
	Minus nubi.				49	117	0	07
30	Multa	S 1	S S W		68	127		
	Pluvia.	S b W 4			71	142		1.
					71	124	10	81

SEPTEMBER.

6 . . . . . 12 . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
5	Nunc Apricum, nunc Nubilum.	SW bW 0 3	WSW	29	88 88 84	107 144 118		
10	Nubilum. Imber.	S SW 0	SW ſup. NW inf.		77 86	102 108		
15	Nubilum. Nebuloſum. Nubilum.	WNW 0 W 1	NbW NW	30	13 15 15	119 145 129		
20	Nubiloſum.	E 1 EbN 4			25 25 22	124 138 128		
25	Pluviola.	SWbS 1 SSW 0		29	36 38 40	110 122 113		
30	Pruina & Apricitas.	NW 0 WbN 1			48 50 42	93 112 92	2	04

OCTOBER.

7 . . . . 12 . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
5	Nunc Imbres, nunc Apricum.	S 1 SbW 2		28 29	93 99 10	111 127 111	0	56
10	Nebula craſſa. Apricum.	SE 0 ESE 0		 30	93 98 05	101 128 108		
15	Nubiloſum. Apricum.	WSW 2	W	29	75 78	98 108		
20	Apricum. Nubilum. Tonitru, &c.	SE 1 EbS 2 ENE 2	SEbE	29	18 16 22	86 112 108	5	69
25	Apricum & Frigidum.	N 2 3		 30	86 92 04	86 103 87		
30	Gelu cum Apricitate.	NbE 2		29 30	94 00	87 89	 16	1. 01.

NOVEMBER.

8......12....9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
	Gelu, &	E N E 1	E	29	68	83		
5	Apricitas.	E b N 1			72	103		
	Nubilum.				72	101		
10	Nubilum.	S 2			80	103		
	Pluvioſum.	6			44	120	0	27
15	Geloſum							
	&							
	Apricum.			30	05	80		
	Nebula craſſa.	N 2		29	57	89		
20	Pluvia.	W 1			57	89		
	Turbidum.	9			35	98	0	91
	Gelu &	W 0			65	79		
25	nebula tenuis.				67	85		
					71	76		
	Neb. tenuis.	S b W 2			10	102		
30	Nubilum	4	S S W		10	112	5	84
	Pluit.			28	84	111		

DECEMBER.

8. . . 12 . . . 9

	Cœlum.	Ventus.	Nubes.	Barom.		Th.	Pluvia.	
	Nunc Nubilum,	W 2		29	10	92		
5	nunc	W b N 3	N W		25	102		
	Apricum.				46	92		
		N N W 1			45	88		
10	Nubilum.							
					61	89		
	Pluviola.	S W b W 1			34	100		
15		W b S 3			36	101		
	Pluit.				31	95	1	21
	Pluit.	S 1		28	73	94		
20	Clarius.				73	100		
	Gelu.				76	84	1	83
	Nubilum.	N b E 1	N N E	29	72	94		
25	Pluvia.				76	96		
	Nivoſa.				90	88	0	48
		S E b S 1			92	87		
30	Caliginoſu.	S E 1			90	88		1.
					86	85	21	70

Quatuor Plagæ principales his literis notantur, viz. N. Septentrio: S. Meridies: E. Oriens: W. Occidens. Plagæ intermediæ harum literarum conjunctione denotantur. Cyphra [0] notat Aeris tranquillitatem, ſive nullum flare Ventum. [1] Ventum adeo languidum denotat, ut candelam accenſam vix extinguere valeat. [2] fortiorem. [7, 8 ad 12, 15 vel 20] denotant Ventos violentos, & magis bacchantes.

Quoad Columnam *Thermometri*, notandum eſt, *Gelationis* gradum eſſe circa 85. Sed Pruina eveniet circa 90, vel paulo ſupra.

In Columna *Pluviarum*, aliquando notavi Pluviæ pondus, quod in diebus pluvioſis (in Tabula notatis) decidit. Et in fine cujuſque Menſis Summa Pluviæ totalis iſtius menſis notatur. In toto hoc Anno 84,62 Libræ Pluviæ deciderunt, iſtarum Librarum quas Angli *Troy-weight* vocant. *Infundibulum* Pluviam recipiens eſt circulare, cujus Diameter 12. pollicibus Anglicanis æqualis eſt.

Horæ obſervandi in ſummitate cujuſque menſis notantur.

Circa finem Februarii, & per maximam Martii partem, Noſtrates *Dyſpnœa*, & *Tuſſi* ubique fere affecti ſunt.

Aug. 11. Ventus adeo bacchatus eſt, ut pernicioſiſſimus arborum fructibus, eorumque emptoribus fuerit.

Et quamvis pluvia copioſa ſucceſſit, tamen Stagna arida fuere in Septembre, & magna Graminis inopia.

Dec. 19. Maximus fuit (ut opinor) *Mercurii in Barometro Deſcenſus* hoc mane; ſequenti modo,

8^{h}. $\frac{1}{4}$ mane —— —— 28,28 pollices
10 —— —— —— 28,06
11 —— —— 27, 94
$11\frac{1}{2}$ —— —— —— 27,94
$12\frac{1}{2}$ —— —— 28,03
1 p. m. —— —— 28,13
1. 10. —— —— 18
1. 20′ Ventus W 7 —— 20
2 Ventus W 9. —— —— 34

Cœli autem Tempeſtatumque mutationes non adeo notabiles, ac Mercurii. Tantum ventus poſt meridiem vehemens fuit, & noctu multum Pluviæ. Sed audivimus calamitoſiſſimam tempeſtatem Corbili eodem die fuiſſe.

Hic maximus Mercurii deſcenſus ab aliis obſervabatur. In Obſervatorio Grenovicenſi ad 27,80 pollices Mercurius deſcendebat; Cantuariæ urbis, ad 27,90.

Si terra non abſorpſiſſet Pluviam, ad 16,924 pollices Anglicanos fere exurrexiſſet. Hic Annus ideo pro ſicco habendus eſt. Nam proportio Pluviæ media ſingulis Annis eſt circa $20\frac{1}{2}$ pollices *Upminſtri*; $42\frac{1}{2}$ *Townelei* in *Comitatu Lancaſtriæ*; & 22 *Pariſiis* in *Gallia*; & 24 pollices in urbe *Flandriæ* vocata *Inſula*.

D. M.

XI.
The Weather, in a Voyage to China, *in* 1700. *by Mr.* James Cunningham, *n.* 1639.

D. M.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.	Long. E. fr. S. Jago.	Needles Variatio	Needles Depreſſi.
Jan. 31	5 Divi.		1° 26′ N	6° 16′ E		80 30′ N.
Feb. 1	4		1 18 N	6 11 E		
2	5		1 14 N	6 13 E		
3	5		1 07 N	5 57 E		
4	2		0 27 N	5 49 E		
5	4		0 00	5 44 E		
6	4		0 30 S	5 35 E		
7	5		1 46 S	5 08 E		3 30 S
8	4½		3 00 S	4 56 E		
9	5		4 29 S	4 19 E		
10	5		5 57 S	3 54 E		10 00 S
11	6		7 10 S	3 05 E	20 17′ E	
12	6		8 46 S	2 22 E	2 20 E	
13	8		10 29 S	1 37 E	2 50 E	
14	7		12 05 S	1 20 E	3 30 E	
15	7½		13 44 S	1 10 E	4 12 E	
16	7½		15 09 S	1 10 E	4 10 E	19 00 S
17	8		16 32 S	1 14 E	4 52 E	
18	8½		18 01 S	1 19 E	5 14 E	
19	7½		19 14 S	1 29 E	5 42 E	30 00 S
20	8		20 05 S	1 15 E	6 18 E	
21	7		21 16 S	1 35 E		
22	7		22 23 S	1 54 E	7 02 E	
23	5		23 47 S	2 39 E		
24	5		25 21 S	3 28 E		
25	6½		26 38 S	4 09 E	8 00 E	39 00 S
26	6½		27 49 S	4 52 E		
27	8		29 16 S	6 07 E		
28	8		30 01 S	7 34 E		
29	10½		31 26 S	10 20 E		
Mar. 1	12½	8	31 10 S	11 49 E		
2	13	10	31 16 S	13 57 E	4 50 E	42 00 S
3	17½	14	31 13 S	16 04 E		
4	23½	18	30 26 S	17 51 E		
5	26	19½	30 58 S	17 17 E		
6	24	20	32 07 S	17 08 E	3 05 E	
7	23	26	33 06 S	16 54 E		
8	32	32	33 14 S	18 26 E	2 05 E	
9	33	38½	32 43 S	19 59 E		
10	29	34	32 27 S	21 13 E		
11	29	32½	32 01 S	22 32 E		
12	28½	33½	32 36 S	22 23 E		

D. M.	Ther. Alti.	Philoſ. Bar.Al.	Latitude N. or S.	Long. E. fr. S.Jago.	Needles Variatio.	Needles Depreſſi.
13	27	34	33 42 S	22 42 E		
14	26	31	34 08 S	23 23 E	1 15 E	
15	26	30	34 10 S	25 26 E	0 57 E	
16	24	30	34 36 S	27 45 E	0 20 E	
17	25	30	34 54 S	29 48 E	0 22 W	
18	25½	30	34 59 S	33 27 E	1 19 W	47 00 S
19	34	38	34 44 S	36 25 E		
20	26	31½	34 22 S	37 45 E	6 25 W	
21	28	33	34 29 S	39 04 E		
22	37	42	34 08 S	41 31 E		
23	39	36	34 35 S	43 41 E	7 05 W	
24	26½	32	34 08 S	45 06 E	8 20 W	
25	27	30½	33 58 S	47 02 E	8 52 W	
26	25½	26½	33 35 S	48 32 E	9 43 W	
27	27	29	33 51 S	49 56 E	10 39 W	
28	35½	38½	34 03 S	50 36 E		
29	33	34½	34 03 S	50 36 E		
30	30	31	34 03 S	50 36 E		48 00 S
31	26	25	34 03 S	50 36 E		
Apr. 1	—— At the Cape of Good Hope					
8	30½	34		Longitude from thence		
11	31	29	34 45 S	00 43 W		
12	26	28	35 01 S	00 25 W	11 29 W	
13	33	42½	35 30 S	00 08 W		
14	34½	44½	36 52 S	00 36 W		
15	25½	29	37 51 S	00 13 W		
16	27	31½	37 57 S	01 03 E	12 40 W	
17			37 41 S	2 38 E		
18	31	38	38 45 S	3 29 E		
19	26	34	39 53 S	4 50 E		
20	31	39	40 42 S	5 58 E		
21	32½	34	41 06 S	7 49 E		
22	40	45½	39 52 S	10 06 E		
23	38	44	38 51 S	11 34 E	19 06 W	
24	32	33½	39 09 S	11 50 E		
25	39½	41	39 14 S	14 37 E		
26	46	55	38 00 S	17 06 E		dif. 8°.
27	36	45	37 41 S	19 10 E		60 00 S
28	31	37	37 45 S	21 35 E	21 23 W	
29	25	36	37 27 S	23 32 E		
30	23	33	37 30 S	23 57 E	22 27 W	

D. M.	Ther. Alti.	Philoſ. Bar. Al.	Latitude N. or S.			Long. C. Gd. Hope.			Needles Variatio.			Needles Depreſſi.			Diff.
May 1	33	42	37	58	S	25	24	E							
2	32	45	38	16	S	27	08	E	24	30	W				
3	32	40	38	47	S	29	40	E							
4	30	31½	38	50	S	33	20	E							
5	37	37	38	43	S	36	20	E				60	00	S	7°
6	38½	45½	38	35	S	39	54	E							
7	38½	45½	38	17	S	42	07	E				69	00	S	8
8	46½	53	37	49	S	45	51	E	24	20	W				
9	35	40	38	48	S	49	19	E							
10	32	39	38	30	S	52	41	E	24	00	W	72	00	S	8
11	35	46	38	09	S	56	08	E							
12	32	42	37	25	S	58	16	E							
13	33½	47½	37	25	S	59	11	E	20	48	W				
14	34	45½	37	10	S	60	54	E	20	00	W	75	00	S	8
15	30	38½	37	13	S	63	29	E	19	00	W				
16	34	41	36	53	S	65	04	E	18	43	W	70	00	S	6
17	31½	36½	36	48	S	68	14	E	17	40	W				
18	35	41	36	56	S	71	12	E				68	00	S	8
19	35½	41	36	00	S	74	16	E							
20	31	34	35	01	S	76	39	E							
21	32½	37	34	07	S	78	32	E	14	28	W	68	00	S	8
22	27	35½	33	07	S	81	05	E	14	00	W				
23	28½	24½	32	53	S	83	36	E	13	30	W				
24	35	33	31	35	S	85	13	E							
25	29½	30½	30	11	S	86	28	E				68	00	S	8
26	31	34½	29	27	S	87	06	E	10	04	W				
27	31	35	28	01	S	87	59	E							
28	30	33	25	55	S	89	24	E	8	58	W				
29	27	20	23	59	S	90	29	E							
30	25	24	22	49	S	91	32	E	8	12	W	62	00	S	8
31	22	22	21	23	S	92	42	E	7	00	W				
June 1	19	19	19	54	S	93	20	E	6	35	W				
2	17	17	18	02	S	94	10	E							
3	14	13	16	30	S	94	55	E	4	40	W				
4	12	10	15	02	S	95	15	E	4	50	W	53	00	S	7
5	7½	7	13	40	S	95	34	E	5	12	W				
6	5	3	13	01	S	95	42	E	5	20	W	52	00	S	4
7	5	3	12	59	S	95	56	E	5	15	W				
8	5	3	12	26	S	96	17	E	4	42	W				
9	5½	1	11	43	S	96	28	E	4	26	W				
10	5	1	11	10	S	96	34	E	3	52	W				
11	4	0	10	18	S	96	54	E	3	32	W				
12	5	1	8	45	S	97	37	E	3	26	W	46	00	S	6
13	5½	1	7	52	S	97	21	E	3	12	W				

D. M.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.	Long. fr. C. Gd. Hope.	Needles Variatio.	Needles Depreſſi.	Diff.
14	4½	0	7 23 S	95 56 E			
15	5	0	6 45 S	95 16 E			
16	4	0	Betwixt Java Head and Batavia.				30
17	2½	0					
18	2	0					
19	2	0					
20	1	0		Longitud.			
21	1	0		fr. Batavia.		40 00 S	
22	1½	0		00 05 W			
23	4½	0	5 27 S	00 47 E			
24	2	0	5 24 S	1 48 E			
25	3	0	5 51 S	1 55 E			
26	6½	2½	6 12	1 51		38 00 S	4
27	5	0	6 16	1 59			
28	5	0	6 29	2 02			
29	5	0	6 21	2 18			
30	5	0	6 29	2 33			
July 1	4	0	6 44	2 43			
2	4½	0	6 39	2 55			
3	3½	0	6 35	3 34			
4	3½	0	6 30	3 49			
5	5	0	6 35	3 49		45 00 S	8
6	8	2	6 12 S	4 07 E			
7	6	0	6 21	4 28			
8	6	0	6 22	4 43			
9	6	1	6 28	5 13			
10	8½	3	6 50	5 37	1 25 W	41 30 S	2
11	6	0	6 44	5 47			
12	5	½	6 23	6 05			
13	5	0	6 05	6 17			
14	6	2	5 10	6 54			
15	4	0	4 20	7 09			
16	5	0	4 08	7 27			
17	5	0	4 00 S	7 30 E	At the Bar of Banjar on Borneo.		
18	8	4	4 00 S	7 30			
19	7½	1	4 00	7 30			
20	6	0	4 15	7 06		40 00 S	0
21	5	0	4 51	5 06			
22	2½	0	4 59	3 12			
23	4	0	4 45	1 25			
24	7	4	4 09	0 17			
25	5	0	4 01	0 13		35 00 S	6
26	1½	0	3 32				

M. D.	Ther. Alt.	Philo. Ba. Al.	Latitude N. or S.		Needles Variatio.	Needles Depreſſi.	Diff.
27	3	0	In the Streights of Banca				
28	5	0					
29	4½	0	1 59 S	Longitu.			
30	4	0	0 31	from Pulo	1 50 W		
31	4	0	1 25 N	Condore.		31 00 S	50
Aug. 1	2½	0	3 19	1 36 W			
2	1	0	5 07	0 52			
3	1	0	6 04	0 25			
4	1	0	7 47	0 08 E			
5	3½	0	9 16	1 25			
6	2	0	10 14	3 07			
7	1	Extr. Heat 0	12 04	4 33 E		5 30 S	13
8	1	0	14 05	5 58		4 00 S	12
9	1½	0	16 15	7 02			
10	2½	0	18 14	7 20			
11	1½	0	19 49	7 12			
12	½	0	21 17	7 02		2 30 S	1
13	ab. 1½	0	21 58	7 36			
14	bel. 1	0	22 15	7 47		6 00 N	2
15	1	0	22 18	8 09			
16	0	0	22 32	8 43	1 20 W		
17	½	0	23 10	9 48			
18	1½	0	23 32	10 04 E			
19	2½	0	23 56	10 18			
20	4	0	24 12	10 28			
21	1	0	24 22	10 43		12 00 N	6
22	3	0	24 32	11 01			
23	4½	0	24 47	11 15			
24	6	0	24 56	11 28			
25	5	0	25 09	11 38			
26	6	0	25 09	12 08			
27	5	0	25 07	12 20			
28	5	0	25 29	11 50			
29	4	0	25 37	12 02 E			
30	3½	0	25 49 N	11 47			
31	2	0	26 02	11 53			
Sept. 1	2½	0	26 05	11 56	At Crocodile Iſland.		
9	3	0	25 44	12 38			
10	3½	0	26 11	12 13			
11	5	0	26 11	12 47			
12	4½	0	26 22	12 37			
13	8½	0	26 26	12 40			
14	6½	0	26 37	12 59			

15

D. M.	Ther. Alti.	Philoſ. Bar. Al.	Latitude N. or S.	Long. fr. Pul. Con.	Needles Variatio.	Needles Depreſſi.	Diff.
15	5	0	27 05 N	13 11 E			
16	7	0	26 55	14 01			
17	8	0	27 07	14 15			
18	10	7½	27 26	14 13			
19	9	6½	27 42	14 02			
20	7½	4	27 46	14 25			
21	12	10	28 03	14 25			
22	15	12½	27 49	15 31			
23	17	14	27 51	15 01			
24	14	13	27 53	16 26			
25	14	12	28 10	15 36			
26	13½	13	28 47 N	15 04 E			
27	14	13	29 06	14 49			
28	15½	17	28 55	15 09		17 30 N	50
29	15	13	29 02	15 09			
30	15	17	29 43	15 19	1 00 N		
Oct. 1			29 56	14 55			
2			29 56	14 55			
10	20	20	29 56	14 55			
11	12		30 25	14 20			
12	17	15	30 25	14 20	At Chuſan.		
13	25	32					
14	24	30	30 25 N	14 20 E	00 56 E	21 00 N	
15	22	28					
16	25	29					
17	16	14					
18	15	13					
19	23½	31					
20	24	30					
21	24	29					
22	25	30					
23	26	30					
24	27½	32					
25	24	28					
26	22½	26					
27	20	27					
28	36½	45					
29	45	58					
30	46	59					
31	47	65					

Jan. 31. Variable Breezes, and 10 Hours calm; rainy and cloudy. *Feb.* 1. N S by W S W by S and 16 Hours calm, rainy and cloudy with Lightning. 2. Variable Breezes, and eleven Hours calm, fair. 3. Variable, fair with Rain at Noon. 4. Variable, fair and cloudy, Rain in the Forenoon. 5. Variable with 9 Hours calm, rainy and cloudy. 6. Variable with 4 Hours calm, fair and cloudy, with ſome Rain. 7. Small Gales from E by S to S E by S, Fair and cloudy. 8. Eaſy Gales from E by S to S E by E, Fair and pleaſant. 9. Eaſy at E S E, and S E by E, Fair and pleaſant. 10. Eaſy at S E by E, and S E, Fair and pleaſant. 11. Fine Gales S E by E, Fair and pleaſant. 12. E S E fine. Fair and pleaſant. 13. E S E and E by S, Fair and pleaſant, with one Shower. 14. E by S and E, Fair and cloudy, with ſome Squales. 15. E by N to E S E, Fair with one Squale. 16. E by S and E, Fair and pleaſant. 17. E, Fair and pleaſant. 18. E, Fair and cloudy, with one Shower. 19. E by S to E by N, Fair with one Shower. 20 S E by E to E by N ſmall, Fair and cloudy, with ſeveral Squales. 21. N N E to E by N eaſy, Fair with two Showers. 22. N N E to E by N, Fair with one Shower. 23. N N E to N N W, Fair and pleaſant. 24. N N E to N E by E, Fair and pleaſant. 25. N E by N to N N E, Fair and pleaſant. 26. N E by E N, Fair and pleaſant. 27. N to N W, Fair, ſometimes cloudy. 28. W N W to W S W, Cloudy and ſqually, with Rain and Lightning. 29. W N W to N by E freſh, Squally with much Rain, and ſome Thunder.

March 1. N W to W moderate, uncertain with Thunder and Rain. 2. W to N W moderate; Fair and cloudy. 3. W to S freſh, cloudy and ſqually. 4. S by E to S E by E, Squally and cloudy. 5. E S E and E by S, Fair and cloudy. 6. E by S to E by N, moderate, Fair and cloudy. 7. E by N to S E by E, ſmall, Fair and cloudy. 8. S E to S S W, moderate, Fair and cloudy. 9. S to S S W, blowing hard, Cloſe and ſqually. 10. S by E and S, moderate, Gray and cloudy. 11. S b E to S E by E, Squally, cloſe and cloudy. 12. S S E to E by S, Dry, cloſe and cloudy. 13 E by S to E by N, eaſy. Fair and cloſe. 14. Variable and ſmall, Fair and cloſe. 15. N to N W by N eaſy, Fair and ſerene. 16. N by W to N N E, Fair and ſerene, ſometimes cloſe. 17. N by E to N N W, a fine Gale, Fair and ſerene. 18. N to N N W, Fair and ſerene, this Forenoon cloudy. 19. N N W to S W, and S by W, thick and ſqually, this Forenoon fair. 20. S W to N to N W eaſy, Fair and cloudy. 21. N W by N to W eaſy, fair and cloudy. 22. W to S S E fine, Fair and ſometimes ſqually. 23. S to W S W fine, Variable weather. 24. S S W W S W ſmall, Fair and pleaſant. 25. S W by S to S E S eaſy, Variable. 26. S E by S to S by W moderate. Fair and Cloudy. 27. S W by S to S moderate, Variable. 28. S W b S to S by W ſmall, Fine moderate weather. 29. S E ſmall, ſometimes freſh, Fair and pleaſant. 30. S W to S E, moſt part calm, Fair and pleaſant. 31. Variable Breezes and calm, Fair and pleaſant.

April 1. S to S E, ſmall, The ſame. 2. S E ſmall, the ſame. 3. S E, and S E by S, moderate, the ſame. 4. S E and S S E ſmall and calm, the ſame. 5. S E by S ſmall, at night freſh, the ſame. 6. S E ſmall, the ſame. 7. Variable and calm, the ſame. 8. Calm, at night blowing freſh, the Forenoon foggy, Afternoon clear'd up. 9. S S E and S by E, blowing hard, Fair and hazy. 10. S S E, fine Gales. Fair and pleaſant. 11. S E by S to N E moderate, Fair and gray. 12. Variable and ſmall, Fair and cloudy. 13. S S E to S E by E, moderate, Squally. 14. S E to E by N, Variable. 15. E to E N E ſmall, Fair and cloudy. 16. S by E to S W by S, ſmall, ſometimes calm, Variable. 17. S S W by E S E, Variable. 18. E by S to E N E ſmall, Fair and cloſe. 19. E by S to N E by N moderate. Fair and cloudy. 20. N E by E to E by S moderate, Cloudy and overcaſt. 21. N E by E to N E by N eaſie, Moderate Weather. 22. W S W to S E freſh, Variable. 23. S E to S S E ſmall, Fair and cloudy. 24. S E by N N E ſmall, Fair and pleaſant. 25. Variable Gales, Fair and cloudy. 26. W by N to S W, blowing hard, Variable with Rain and Hail. 27. S W by S to W N W freſh, Cloſe and cloudy. 28. W N W to N W by N moderate, Fair, ſomewhat cloudy. 29. N W to S W eaſie, Variable. 30. W S W to S E by S ſmall, Cloſe Weather.

May 1. N N E to E ſmall, Cloſe and cloudy. 2. N E by E to N by E eaſie, cloſe. 3. N E by N to N N W freſh, Cloſe and ſqually. 4. N N W to N W freſh, Fair and cloudy. 5. N W to S W, freſh, Variable and ſqually. 6. N W to S W hard, Variable and ſqually. 7. W N W to S W moderate, Fair weather. 8. W N W to S W by W freſh, Variable. 9. W S W and W N W freſh, Variable. 10. W by N to N W by W freſh, Variable. 11. W N W and W freſh, Moderate with ſome Rain. 12. W to S W eaſie, the ſame. 13. S W to N N E ſmall, Cloudy weather. 14. W N W to N W by N, ſmall, Fair and pleaſant. 15. W N W to S W fine Gales, Variable. 16. S W to W N W eaſie, Cloſe and hazy with Rain. 17. W N W to N W freſh, Variable. 18. W N W and W by N fine, Fair and cloudy. 19. W N W and W freſh, Moderate. 20. N W by W to W fine, the ſame. 21. W by S to N W by N, the ſame. 22. N W by N and N W, the ſame. 23. N W by N to N E, Variable. 24. N by E to W by S, Thick and ſqually. 25. S W to W N W, Variable. 26. S W by W and S W by S, Fair and pleaſant. 27. S W to S E ſmall, the ſame. 28. S E and S E by E, Variable. 29. S E by E to S S E, Squally and rainy, with Thunder and Lightning. 30. S E and S E by E, Variable. 31. S E to S S E, Fair and ſerene.

June 1. S E and S E by E, Fair and pleaſant. 2. S E by E and E S E, the ſame. 3. S E by E and E S E, the ſame. 4. E by S to E by N, the ſame. 5. E by N to E by S, the ſame. 6. E to N E by E, the ſame. 7. E by N to E S E, the ſame. 8. E by N to S E, the ſame. 9. E S E by E N E, the ſame. 10. E by N and E, the ſame. 11. E by N to E S E, the ſame. 12. E by S to E S E, the ſame. 13. E by S to N N E, the ſame. 14. E S E to N N E, the ſame. 15. S S E to S E, the ſame. 16. S S E S S W and calm, the ſame. 17. S S W S E and calm, the ſame. 18. S E and E by S, the ſame. 19. E N E and S E, the ſame. 20. N E by E to S S E, the ſame. 21. N N E to S, the ſame. 22. N to S S E, the ſame. 23. N W by W and S W, the ſame. 24. S by W and S E by E, Cloudy with ſome Rain. 25. E S E to N E by E, Squally, with Thunder, Lightning and Rain. 26. *E S E* to *N E* by *E*, Cloudy, with Rain. 27. Cloſe, the ſame. 28. *E* by *N* to *E S E* ſmall, Variable. 29. *E S E* and *S E* ſmall, Fair. 30. Variable Breezes, Uncertain.

July 1. *E* by *S* to *N E* by *E*, Fairwith ſome Rain. 2. *N E* by *E* to *S E* by *E*, Fair with ſome Rain. 3. *N E* by *E* to *S E* by *E*, Fair and ſerene. 4. *N E* to *S S E*, the ſame. 5. *N E* by *N* to *S E*, the ſame. 6. *S E* ſmall, the ſame. 7. *S E* to *S* by *E*, the ſame. 8. *S E* by *E* to *E N E*, the ſame. 9. *E* by *S* to *E* by *N*, the ſame. 10. *S E* by *E* to *E* by *N*, the ſame. 11. *E N E* to *S S E*, the ſame with ſome Rain. 12. *E* by *N* to *S E*, Fair and ſerene. 13. *S E* to *E* by *S*, the ſame. 14. *S E* to *E S E*, the ſame with ſome Rain. 15. *S E* by *S* to *E S E*, Fair and cloudy. 16. *S E* by *E* to *N E* by *E*, Fair and ſerene. 17. *E* to *S E* and calm, Fair and cloudy. 18. *E* to *S E* by *S* ſmall, Cloſe and cloudy with Rain. 19. *S E* freſh, Cloſe and clearing up. 20. *S S E* to *S E*, Fair and ſerene. 21. *S E* by *S* and *S E*, Fair and cloudy. 22. *S E* by *E* to *E* by *S*, the ſame. 23. *S* by *E* to *E* by *S*, Cloſe with ſome Rain. 24. Variable, Squally with Thunder. 25. *S* to *E* by *S*, Fair and cloſe with Lightning. 26. *E* by *S* to *S E* by *S*, Fair and ſerene. 27. *E N E* to *S* by *E*, Variable. 28. *S E* by *S* to *S*, Fair and ſerene. 29. *S E* by *E* to *S*, the ſame. 30. *S E* to *N N E*, the ſame. 31. *S S E* to *S E* by *S*, the ſame.

Aug. 1. *S S E* to *S* by *W*, Fair and cloſe. 2. *S* by *W* to *S E*, Variable with Thunder and Lightning. 3. Variable, Fair and cloſe. 4. *S S W* to *S W* by *S*, Fair and pleaſant. 5. *W* to *S W*, Fair, cloſe and hazy. 6. *S W* by *W* to *W*, Fair and hazy. 7. *S W* by *W* to *S W* by *S*, Fair and ſerene. 8. *S W* and *S W* by *W*, the ſame. 9. *W* by *S* to *S W* by *S*, Fair and cloudy. 10. Variable, Squally. 11. *W S W* to *W N W*, blowing hard, Squally and much overcaſt. 12. *W S W* to *S S W*, moderate, Fair and cloſe with ſome Rain. 13. *S S W* to *S E* by *S* ſmall, Fair and ſerene. 14. *S E* to *N N E*, Fair and pleaſant with one Shower. 15. *E* by *N* to *N E* by *E*, Fair and pleaſant. 16. Variable and calm, the ſame. 17. *W S W* to *S W* eaſie, Fair, with ſome drizling Rain. 18. Variable and ſmall, Fair and ſerene. 19. *N* to *N E* by *N* freſh, the ſame. 20. *N E* by *E* to *N* by *E*, the ſame. 21. *N E* by *E* to *N* by *E*, the ſame. 22. *N E* to *N N E*, the ſame. 23. *N E* by *E* to *N N E* eaſie, Fair and pleaſant. 24. *E N E* to *N E* by *N* freſh, Variable. 25. *E N E* to *N* by *E* moderate, Fair and pleaſant. 26. *N* by *E* to *N E* by *E*, the ſame. 27. *E N E*, to *N N E*, the ſame. 28. *E* by *N* to *N N E*, Variable. 29. *N E* by *E* to *N*, Variable. 30. *N* by *E* to *N E* by *E* freſh, Cloſe and ſqually. 31. *N E* by *N* to *E* by *N*, Variable.

Sept. 1. *N N E* to *N E* by *E*, Fair and pleaſant. 2. *N E* ſmall, The ſame with ſome Rain at Night. 3. *N N E* ſmall, Fair and pleaſant. 4. *N* by *E* to *N E*, the ſame. 5 *N E* moderate, Fair and cloudy. 6. *N E* freſh, at night *S W* blowing hard, the ſame, at night much Rain. 7. *N E* freſh and moderate, Cloudy with ſome Rain. 8. *N E* moderate, Fair and pleaſant, at times overcaſt. 9. *N E* moderate, Fair and hazy.

10. *NE by N to NE by E*, the ſame. 11. *NE to NNE*, the ſame. 12. *NE by N to E by S* ſmall, Fair and pleaſant. 13. *ENE to NE* moderate, Fair. 14. *NNE to ENE*, Fair and cloudy. 15. *NE by E to E by N*, Fair, cloſe and cloudy. 16. *ENE to N by W*, Fair and cloudy. 17. *N to NE by E*, the ſame. 18. *NE to N by E*, Variable. 19. *N by E to NE by E*, Fair. 20. *NE by E to N by E* freſh, Fair and cloudy. 21. *NE to NNE* moderate, Fair and pleaſant. 22. *NE by N to N by E*, Fair with ſome Rain. 23. *NNE to N* freſh, Fair and cloudy. 24. *N by W to N by E* ſmall, Fair, and much overcaſt. 25. *N by E. NE by N*, Fair and cloſe. 26. *N by E to E by N*, Variable. 27. *NNE to NE by E*, Fair and pleaſant. 28. *NNE to NE*, Fair and cloudy. 29. *NE by N*, Fair, ſometimes cloſe. 30. Variable from *SSE to NW*, Fair, pleaſant and cloudy.

Octob. 1. *WNW to NE by E*, Fair and cloſe. 2. *NNW and N* ſmall, Thick and foggy with Rain. 3. *NNW to NW*, ſmall, Variable, Forenoon ſerene. 4. *N to NE* moderate, Variable. 5. *NNW to NW*, blowing freſh, Fair and Cloudy. 6. Forenoon calm, Afternoon *SE* freſh, Fair and Serene. 7. *NNE to NE*, moderate, Cloudy with Rain. 8. *N to NNW*, Cloudy and overcaſt. 9. *N by W to NE*, Cloudy and hazy with Rain. 10. *NE to SE* moderate, Cloudy and fair. 11. *SE to SW* ſmall, Fair and ſerene. 12. *SSW* ſmall, the ſame. 13. *NNE to NE* Fair and cloudy. 14. *NE* moderate, Fair and cloudy. 15. *N* ſmall, Fair and cloudy. 16. *NE to E* moderate, Cloudy with ſome Rain. 17. *SE* ſmall, Thick and hazy with Rain. 18. *SE* moderate, Thick and hazy, with much Rain. 19. *NE* ſmall, Fair and cloudy 20. *NNE to ENE*, the ſame. 21. *NNE to SE*, Cloudy with ſome Rain. 22. *N to NW* freſh, Fair and cloudy. 23. *N by W to WNW* ſmall, Fair and pleaſant. 24. *S and SSE* ſmall, the ſame. 25. *SE* moderate, the ſame. 26. *SE to S by E* moderate, the ſame. 27. *NW to N by W* moderate, Cloudy with ſome Rain. 28. *NW* ſmall, ſometime freſh, Thick and hazy with Rain. 29. *NW to N* moderate, the ſame. 30. *NNW to N by E* ſmall, Fair and cloudy. 31. *NW* ſmall, the ſame.

Note 1. That the Altitude of the Spirits in the Thermometer was taken below extream Heat, and the Obſervations of that, and of the Philoſophical Barometer were commonly taken at Noon. 2. The account of the Winds and Weather at Sea, is from Noon to Noon.

3. The middle Inclination of the Dipping Needle is ſet down with the difference alſo which was made, as either ſide of the Compaſs was turn'd Eaſt or Weſt: which difference at firſt was not taken notice of. From whence this difference ſhould ariſe I cannot determine, the Compaſs ſeeming to be juſtly pois'd and equally divided.

XII. The following Obſervations were of a portable Barometer from *England*; which by a Barometer ſet up here were always $\frac{6}{20}$ of an Inch lower: And the Barometer ſtood about 18 Feet above the *Superficies* of the Sea at high Water.

Weather, &c. *at* Chuſan, *by the ſame, ib. p.* 1648.

NOVEM-

NOVEMBR 1700.

1. Grey cloudy Weather, very cold and moderate Gales from NW to N.

2. Grey cloudy Weather, with moderate Gales from N W to N. and very cold.

3. Grey cloudy Weather, very cold and ſmall Gales from N by W and N N W. At Night little Wind, and more ſerene.

4. Grey cloudy Weather, very cold and moderate Gales at N N W and N by W.

5. Fair and ſerene Weather, with ſmall Gales from N N W to N. The Air temperate.

6. Fair and pleaſant Weather, with ſmall Gales at N W and N N W.

7. Fair and pleaſant Weather, ſomewhat hazy, and ſmall Gales at N N W. At Night calm.

8. Fair and pleaſant Weather, with ſmall Gales at N. At Night little Wind.

9. Fair and ſerene Weather, with ſmall Gales at N. At Night calm.

10. Very ſerene and warm Weather, with ſmall Gales at N by W In the Night calm.

11. Dry and ſerene Weather, with ſmall Gales from SE. At Night calm.

12. Dry and ſerene Weather, with ſmall Northerly Breezes. At Night calm.

13. The Morning foggy, all day ſerene with ſmall Breezes at N NW.

14. The Morning grey and cloudy, towards Noon, thick hazy Weather with driſling Rain till 8 at Night. All Day freſh Gales from W by S to N W. At Night leſs Wind and fair.

15. Grey cloudy Weather, with moderate Gales from N W to N.

16. Fair and pleaſant Weather with ſmall Gales from N to N by E.

17. Dry and ſerene Weather, with ſmall Gales at N and N N W.

18. Grey cloudy Weather, with moderate Gales from N W to W. In the Night cold.

19. Dry Weather, ſomewhat cloudy, with ſmall Gales from N W to N. Cold at Night.

20. Dry and pleaſant Weather, with ſmall Gales at N N W.

21. Fair and pleaſant Weather, with ſmall Gales from W by S to N W.

22. Fair and pleaſant Weather, ſomewhat hazy with Gales at SE.

23. Fair and pleaſant Weather, the Afternoon overcaſt, with moderate Gales at N W to N.

24. Dry Weather, ſomewhat cloudy, with moderate Gales from N W to N.

25. Fair and pleaſant Weather, with ſmall Gales from N by W. At Night calm and cold.

26. Fair and pleaſant Weather, with ſmall Breezes at N W for the moſt part calm. *Mercury* Altitude 30 $\frac{8}{20}$.

27. Grey cloudy Morning, with ſmall Gales at W N W. *Mercury*'s Altitude $30\frac{6}{20}$. In the Afternoon fair and pleaſant with ſmall ſoutherly Breezes. At Night calm.

28. Fair and pleaſant Weather, with ſmall Gales at N W. *Mercury* $30\frac{6}{20}$. The Afternoon ſmall Breezes at S W. At Night calm, and the Breezes veering to N, the Air temperate. *Mercury* $30\frac{4}{20}$.

29. Fair and ſerene Weather, with Calms. *Mercury* $30\frac{5}{20}$. In the Afternoon ſmall Gales at S E. At Night grey cloudy Weather, the Gale veering to N. *Mercury* $30\frac{6}{20}$.

30. A grey cloudy Morning, with moderate Gales at N W and WNW. *Mercury* $30\frac{6}{20}$. All day more ſerene. In the Evening overcaſt, and ſome Rain at 9 at Night.

DECEMBER. 1700.

1. Grey cloudy Weather all day and night, with freſh Gales from N to N E. *Mercury* $30\frac{9}{20}$ falling to $30\frac{8}{20}$.

2. In the Morning fair and ſerene. *Mercury* $30\frac{5}{20}$. Since overcaſt and grey cloudy Weather, with moderate Gales at NNE and N. In the Evening ſome Drops of Rain, and ſometimes blowing freſh in the night and very cold.

4. Grey cloudy Weather, with moderate Gales at N to N W. *Mercury* $30\frac{12}{20}$, at night falling to $30\frac{11}{20}$, then almoſt calm.

5. A grey cloudy Morning, towards Noon more ſerene. *Mercury* $30\frac{11}{20}$. Freſh Gales at N E. in the Evening overcaſt with ſome drops of Rain. Little Wind all night.

6. A grey Morning ſomewhat cloudy, and a ſmall Breeze at N N E. *Mercury* $20\frac{9}{20}$. In the Afternoon overcaſt, with the Wind at S. and ſmall drops of Rain. The *Mercury* falling to $30\frac{8}{20}$. Some Rain in the night.

7. Cloſe thick Weather, with drizling Rains all day and night, and ſmall Winds at N N E and N *Mercury* $30\frac{7}{20}$.

8. A grey cloudy Morning, with ſome drizling Rain, and moderate Gales at N and N by W. *Mercury* riſing above $30\frac{7}{20}$. All day and night overcaſt; the *Mercury* as before.

9. A grey cloudy ſharp Morning, and ſmall Winds at N NW. *Mercury* $30\frac{6}{20}$. Cloudy all day, and towards Evening cloſe Weather and calm, *Mercury* $30\frac{5}{20}$.

10. Dry Weather, ſomewhat grey and cloudy with ſmall Breezes at N N W. *Mercury* $30\frac{4}{20}$. All day overcaſt with variable Breezes intermixt with Calms, *Mercury* as before.

11. Fair and pleaſant in the Morning, ſince overcaſt with variable Breezes, the *Mercury* as before.

12. Grey cloudy Weather, in the Forenoon ſmall Gales at S E. *Mercury* $30\frac{4}{20}$. In the Afternoon the Gale freſhning at N W. *Mercury* $30\frac{5}{20}$. With ſome Rain all night.

13. Grey cloudy Weather, with moderate Gales from N W to N *Mercury* 30 $\frac{4}{20}$. Cold at night.

14. A ſharp Morning and fair pleaſant Weather, with ſmall Gales at N N W and N. *Mercury* 30 $\frac{6}{20}$. At night Calm, *Mercury* 30 $\frac{5}{20}$.

15. Fair and pleaſant Weather, with moderate Gales at S E. *Mercury* 30 $\frac{4}{20}$ falling to 30 $\frac{3}{20}$.

16. The Morning ſomewhat cloudy, with ſmall Gales at S E (*Mercury* 30 $\frac{2}{20}$.) At noon veer'd to N W. and the Sky overcaſt; at night ſome Rain, much Wind and Cold.

17. A ſharp Morning and grey cloudy Weather, with moderate Gales from N W to N N W *Mercury* 30 $\frac{7}{20}$. All day overcaſt, at night little Wind and much Rain.

18. Thick cloſe Rainy weather, all day and night with ſmall Gales at NW.

19. Grey cloudy Weather, with moderate Gales at N W to N. *Mer.* 30 $\frac{6}{20}$. Some Rain at night and very Cold.

20. Grey cloudy weather with moderate Gales at N N W, and cold, *Mercury* 30 $\frac{7}{20}$. At night little Wind.

21. Grey cloudy Weather and cold, with moderate Gales from N N W to N W *Mercury* 30 $\frac{7}{20}$. At night drizling Rains. *Mercury* 30 $\frac{6}{20}$.

22. In the Morning cloſe Weather, with drizling Rains and moderate Gales at N W and N N W *Mercury* 30 $\frac{6}{20}$. The Afternoon dry, grey and cloudy.

23. A grey cloudy Morning and Calm, *Mercury* 30 $\frac{5}{20}$, towards noon more ſerene and a ſmall Breeze at E S E. In the evening overcaſt with ſome Rain and freſh Gales, all night at N N W.

24. Grey cloudy Weather, ſomewhat cloſe, with freſh Gales from N N W to N W by W.

25. Grey cloudy Weather, with moderate Gales at N W.

26. Cloſe Weather with drizling Rains, and ſmall Breezes at N E, for the moſt part calm. In the night the Gale freſhned at N. *Mer.* $\frac{6}{20}$.

27. The forenoon grey cloudy Weather, and ſmall Gales at N N E, *Mercury* 30 $\frac{7}{20}$. The Afternoon and all night cloſe Weather with drizling Rains, the Breeze veering to E N E.

28. Grey cloudy Weather, with ſome drizling Rain, and ſmall Northerly Gales, *Mercury* at 30 $\frac{7}{20}$.

29. In the morning ſomewhat fair, then overcaſt with drizling Rains and cloſe Weather all day and night, ſmall Gales from NNE. to N E, *Mer.* 30 $\frac{6}{20}$.

30. A grey cloudy morning, with Gales at E N E, *Mercury* 30 $\frac{7}{20}$. All Day the aforeſaid weather.

31. In the morning fair and pleaſant, with ſmall Gales at S E *Mer.* 30 $\frac{5}{20}$ In the forenoon overcaſt, *Mercury* falling to 30 $\frac{3}{20}$. The afternoon and night cloſe, thick foggy Weather, with ſome drizling Rain and calm.

JANUARY, 1701.

1. Dry Weather, ſomewhat cloſe, with ſmall Gales at S E, *Mercury* 30 $\frac{1}{20}$. The Afternoon overcaſt and cloſe Weather, with ſmall Gales

at E S E, *Mercury* falling to $29\frac{19}{20}$, and much Rain in the night.

2. Cloſe Weather, and drizling Rains, with moderate Gales at N N E *Mercury* $30\frac{1}{20}$. At night blowing freſh, *Mercury* riſing to $30\frac{3}{20}$.

3. Cloſe and cloudy Weather, with drizling Rain, and moderate Gales at N *Mercury* $30\frac{5}{20}$.

4. A grey cloudy Morning, with moderate Gales at N E, *Mercury* $30\frac{1}{20}$, Afternoon cloſe and thick Weather, with drizling Rains, *Mercury* 30. Much Rain in the night.

5. Thick cloſe Rainy Weather, with moderate Gales at N E, *Mercury* $30\frac{3}{20}$. At night fair and cold,

6. A grey cloudy Morning, with freſh Gales at N E, *Mercury* $30\frac{6}{20}$ At noon $30\frac{7}{20}$, at night $30\frac{6}{20}$, and ſome Rain.

7. Cloſe and cloudy Weather, in the morning; *Mercury* $30\frac{5}{20}$, towards noon drizling Rains, and encreaſing in the afternoon, with ſmall Winds at N E, *Mercury* $30\frac{4}{20}$.

8. Thick cloſe and cloudy Weather, with drizling Rains and ſmall Gales at N E, *Mercury* $30\frac{2}{20}$.

9. Cloſe and cloudy Weather, with drizling Rains, and ſmall Gales at E S E, *Mercury* $30\frac{4}{20}$, at night fair, *Mercury* $30\frac{6}{20}$.

10. A grey cloudy Morning, with freſh Gales at N. *Mercury* $30\frac{7}{20}$. in the Evening and all Night rainy Weather.

11. A cloſe and cloudy Morning, with drizling Rains and ſmall Gales at N. *Mercury* $30\frac{5}{20}$. All Day the aforeſaid Weather.

12. Thick cloſe rainy Weather all day and night, with moderate Gales at N N W. *Mercury* $30\frac{2}{20}$, much Rain at night.

13. Very thick cloſe rainy Weather, with freſh Gales at N W. *Mercury* 30. In the night cold.

14. A ſharp cold Morning, with much Snow falling and cloſe Weather, with freſh Gales at N W. *Mercury* $30\frac{2}{20}$. Continued Snowing a little all day and night following, *Mercury* $30\frac{3}{20}$.

15. Fair Weather, freezing hard, with ſome Sun ſhining, and freſh Gales at N N W. and N by W. *Mercury* $30\frac{5}{20}$.

16. Fair and ſerene Weather all Day and Night, freezing hard, with moderate Gales at N N W. *Mercury* $30\frac{7}{20}$. The Sun melting the Snow.

17. Fair and ſerene Weather, (the Sun diſſolving moſt of the Snow) with freſh Gales at N by W. *Mercury* $30\frac{9}{20}$. At night ſomewhat cold, freezing hard.

18. Grey cloudy Weather, freezing hard, with moderate Gales at N by W. $30\frac{11}{20}$. At night riſing to $30\frac{12}{20}$.

19. Grey cloudy Weather, with little Froſt, and moderate Gales at N N W. *Mercury* $30\frac{10}{20}$.

20. Grey cloudy Weather, ſomewhat cloſe, with moderate Gales at N N W. *Mercury* $30\frac{8}{20}$, freezing in the Morning, and inclining to thaw at night.

21. In the Morning ſomewhat ſerene, the reſt of the Day overcaſt, with moderate Gales at N W. and ſome Thaw. *Mercury* $29\frac{9}{20}$.

22. Fair and ſerene Weather, with ſmall Gales at W N W. *Mercury* $30\frac{7}{20}$, thawing all Day with the heat of the Sun, at night cold, but not freezing. *Mercury* as before.

23. Grey and cloudy Weather, with ſmall Gales at S E, thawing a little, *Mercury* $30\frac{5}{20}$. At night much Rain and calm, *Mercury* $30\frac{4}{20}$.

24. A Fair and ſerene Morning, with ſmall Gales at N N W and N. *Mercury* $30\frac{4}{20}$. All Day overcaſt, and drizling Rains all night.

25. Cloſe hazy Weather, with drizling Rain and no Wind, *Mercury* $30\frac{4}{20}$. At night much Rain.

26. Very cloſe hazy Weather, with drizling Rains and ſmall Brezees at SE. *Mercury* $30\frac{2}{20}$. In the Afternoon falling to $29\frac{18}{20}$, at night much Rain, the Wind veering to N N W. blowing ſometimes in Guſts.

27. Cloſe Weather, with drizling Rains and moderate Gales at N W. *Mercury* $30\frac{2}{20}$. In the Afternoon fair, and at night freezing.

28. Grey cloudy Weather, freezing hard all Day, with moderate Gales at N W to N, *Mercury* $30\frac{4}{20}$. *This Day, being New Moon, began the* Chineſe *New Year.*

29. Fair and ſerene froſty Weather, with moderate Gales at N by W. *Mercury* $30\frac{6}{20}$.

30. The Morning fair and ſerene, all day overcaſt with moderate Gales at N to N W. *Mercury* $30\frac{7}{20}$. Froſty Weather.

31. Fair and ſerene Weather, freezing hard, with moderate Gales at W N W. *Mercury* $30\frac{7}{20}$.

FEBRUARY, 1701.

1. Fair and pleaſant Weather, with ſmall Gales from W. veering to S S E, and at night to N N W, but no Froſt, *Mercury* $30\frac{6}{20}$.

2. Fair and pleaſant Weather in the Morning, little wind, in the Forenoon fine Gales at N W. *Mercury* $30\frac{8}{20}$, at night little wind.

3. Dry weather, ſomewhat overcaſt, with ſmall Gales at N W. *Mercury* $30\frac{6}{20}$, at night little wind.

4. Dry weather, ſomewhat cloſe, with ſmall Gales at S E, *Mercury* $30\frac{6}{20}$.

5. Fair and cloudy weather, with ſmall Gales at N. W. *Mercury* $30\frac{4}{20}$.

6. The Morning cloſe and overcaſt, the Afternoon ſerene, with ſmall Gales at N W. *Mercury* $30\frac{5}{20}$.

7. Fair and cloudy weather, with ſmall Gales at N N W. *Mercury* $30\frac{6}{20}$.

8. Fair weather, ſomewhat cloudy, with variable Breezes round the Compaſs, *Mercury* $30\frac{6}{20}$.

9. Fair and pleaſant weather, with ſmall Breezes at S E. *Mercury* $30\frac{7}{20}$. At night little Wind from N N W.

10. Cloudy weather, with moderate Gales at N by W. In the Afternoon and all night drizling Rains, *Mercury* $30\frac{4}{20}$.

11. Cloſe weather, with drizling Rains, and ſmall Gales at N by W. *Mer.* $30\frac{1}{20}$. All night much Rain.

12. Cloſe weather, with ſome drizling Rains and ſmall Gales at N by W and N N W, *Mer.* 30 $\frac{2}{20}$.

13. Fair and pleaſant weather, with ſmall Gales from N to S S E *Mer.* 30 $\frac{5}{20}$.

14. Cloſe and cloudy weather, with drizling Rains, and ſmall Gales at N N W. *Mer.* 30 $\frac{1}{20}$. Afternoon and night fair, pleaſant and calm, *Mer.* as before.

15. Fair and ſerene weather, and no Wind, *Mer.* 30 $\frac{3}{20}$. The Afternoon overcaſt, with cloſe weather, and moderate Gales at S E, and ſome Rain, *Mer.* 30.

16. Cloudy weather, and ſomewhat cloſe, with ſmall Gales at N N W. *Mer.* 29 $\frac{19}{20}$. In the night freſher Gales.

17. Grey cloudy weather, with moderate Gales at N N E. *Mer.* 30 $\frac{3}{20}$.

18. Grey cloudy weather, with moderate Gales at N. *Mer.* 30 $\frac{4}{20}$.

19. Grey cloudy weather, with moderate Gales at N N W. *Mer.* 30 $\frac{4}{20}$.

20. Grey cloudy weather, with ſmall Gales at N by W. *Mer.* 30 $\frac{6}{20}$. Very cold, with ſome Snow at night.

21. Grey cloudy weather, with ſmall Gales at N, *Mer.* 30 $\frac{9}{20}$. Some Snow this Morning, whitening the tops of the Hills, and lying all day.

22. In the Morning ſome Sun-ſhining, diſſolving the Snow; all day grey, cloudy weather, and temperate with ſmall Gales at N N W. *Mer.* 30 $\frac{8}{20}$.

23. Dry weather, ſomewhat cloudy, calm in the Morning, at noon blowing freſh from N W till night, then little wind, *Mer.* 30 $\frac{6}{20}$.

24. Fair and pleaſant weather, with ſmall Gales at S E, the Afternoon calm, at night moderate Gales from N N W. *Mer.* 30 $\frac{6}{20}$.

25. Fair and pleaſant, with moderate Gales at S S E and S E, *Mer.* 30 $\frac{6}{20}$.

26. Grey cloudy weather, with drizling Rains, all day and night, and moderate Gales at S E, *Mer.* 30 $\frac{4}{20}$.

27. Fair weather, clearing up with ſmall Gales at S E.

28. Fair and pleaſant weather, with ſmall Gales at N W. In the afternoon veering to W S W, and about to S E. *Mer.* 30 $\frac{6}{20}$.

MARCH, 1701.

1. Dry weather, ſomewhat cloudy, with moderate Gales at S E, *Mer.* 30 $\frac{5}{20}$.

2. The Morning fair and very ſerene, the afternoon overcaſt with ſmall Gales at S E. *Mer.* 30 $\frac{10}{20}$.

3. The Morning fair and ſerene, the afternoon overcaſt with moderate Gales of E S E and S E, *Merc.* 30 $\frac{8}{20}$.

4. Grey cloudy weather, with moderate Gales at S E. At night blowing freſh from N E. *Mer.* 30 $\frac{4}{20}$.

5. Grey cloudy weather, with ſome Rain, and moderate Gales at S E. at night ſome Thunder, Lightning and Rain, *Merc.* below 30.

6. The Morning ſerene and temperately warm, with ſmall Southwardly Breezees. The Forenoon and all day overcaſt, in the afternoon ſome Rain, cloſe hazy weather with ſmall Gales at N by E and N. *Mer.* 30.

7. Grey cloudy weather, with ſmall Gales at E S E, at night much Rain, *Mer.* 30.

8. Grey cloudy weather, ſomewhat hazy, with moderate Gales at N and N by E, *Mer.* $30\frac{4}{20}$.

9. Fair and pleaſant weather in the forenoon, with ſmall Gales at S E. *Mer.* $30\frac{6}{20}$. The afternoon overcaſt, and little wind all night. *Mer.* $30\frac{5}{20}$.

10. Dry weather, ſomewhat cloſe, with ſmall Gales at S E, in the Evening ſome Rain, *Mer.* $30\frac{4}{20}$. In the night much Wind and Rain.

11. Cloſe and cloudy weather, with ſmall Rains and moderate Gales at N N W. *Mer.* $30\frac{4}{20}$.

12. Cloſe and cloudy weather, with moderate Gales from S E to N E. *Mer.* $30\frac{4}{20}$.

13. Grey cloudy and cloſe weather, with ſome Rain and ſmall Gales at S E. *Mer.* 30.

14. Grey cloudy and cloſe weather, with ſmall Gales, variable from S E to N W. *Mer.* $30\frac{3}{20}$.

15. Very cloſe hazy weather, calm all Day, *Mer.* $29\frac{17}{20}$. At night ſmall Gales at W N W with ſome Rain.

16. Cloſe and cloudy weather, with ſmall Gales from N W to N. *Mer.* 30.

17. Fair and ſerene weather, with ſmall variable Gales: *Mer.* $30\frac{4}{20}$.

18. In the Morning overcaſt, with moderate Gales at N W, preſently veering to S E, with drizling Rains all day, *Mer.* $30\frac{3}{20}$, falling to $29\frac{17}{20}$.

19. Grey cloudy weather, for the moſt part calm, *Mer.* $29\frac{18}{20}$.

20. Very thick foggy weather all day, with ſmall variable Breezes, for the moſt part calm, *Mer.* $29\frac{11}{20}$.

21. In the Morning foggy, the reſt fair and ſerene weather, with ſmall Southwardly Gales, *Mer.* $29\frac{18}{20}$.

22. The Morning fair and ſerene, the afternoon overcaſt with ſome Rain and variable Gales, *Mer.* 30.

23. Grey cloudy weather, the afternoon and all night drizling Rains and moderate Gales at N N E, *Mer.* 30.

24. Cloſe weather, with continu'd drizling Rains, and at night much Rain with moderate Gales from N N E to N. and very cold, *Mer.* $30\frac{1}{20}$.

25. The morning ſomewhat cloudy, the afternoon ſerene, with moderate Gales at N. *Mer.* $30\frac{5}{20}$.

26. Dry weather, ſomewhat cloudy, with ſmall variable Gales, *Mer.* $30\frac{4}{20}$.

27. Grey cloudy weather, with ſmall variable Gales, ſometimes calm, *Mer.* $30\frac{2}{20}$.

28. Cloſe hazy weather, with ſome Rain and ſmall variable Gales, ſometimes calm, *Mer.* $29\frac{18}{20}$.

29. The forenoon grey cloudy weather, the afternoon very cloſe and hazy with much Rain, *Mer.* $29\frac{17}{20}$. Small variable Breezes, for the moſt part calm.

30. Cloſe and cloudy weather, with moderate Gales at N N E, *Mer.* $29\frac{18}{20}$. At night riſing to 30, and the Gale freſhning.

31. Fair weather, ſomewhat cloudy, with ſmall variable Gales, *Mer.* 30.

APRIL, 1701.

1. The forenoon overcaſt, afternoon more ſerene, with ſmall Southerly Gales, *Mer.* $30\frac{1}{20}$.

2. Fair and pleaſant weather, with ſmall Gales at S W. *Mer.* $30\frac{2}{20}$.

3. Grey cloudy weather, blowing freſh in the forenoon at N E, afternoon moderate, *Mer.* $30\frac{4}{20}$.

4. Fair and ſerene weather, the Horizon ſomewhat cloſe, with eaſy Gales at S. *Mer.* $30\frac{4}{20}$. In the forenoon the Gale veer'd to W. and the Sky ſomewhat hazy.

5. Cloſe and cloudy weather, with ſome drizling Rain in the forenoon and ſmall Gales from S to E S E. The night calm and Rainy, *Mer.* 30.

6. Cloſe foggy weather, with drizling Rains and calm, *Mer.* $29\frac{19}{20}$.

7. Fair and pleaſant weather, ſomewhat cloudy and calm. In the Evening ſmall Gales at E to N E. All night cloſe foggy weather, *Mer.* $29\frac{18}{20}$.

8. Cloſe foggy weather, with ſmall Northerly Breezes, for the moſt part calm, *Mer.* $29\frac{16}{20}$.

9. The forenoon cloſe and cloudy, afternoon fair and pleaſant, with ſmall Gales at N. In the evening calm, *Mer.* $29\frac{16}{20}$.

10. Fair and pleaſant weather, ſometimes overcaſt, with ſmall Gales from S W to S. *Mer.* $29\frac{18}{20}$.

11. Fair and pleaſant weather, with ſmall Gales from S to S E. *Mer.* 30

12. Fair weather, ſometimes overcaſt, with moderate Gales at N. *Mer.* $30\frac{2}{20}$.

13. Dry weather, ſomewhat hazy, with freſh ſharp weſterly Gales, *Mer.* $30\frac{4}{20}$. In the Evening ſerene and little wind, *Mer.* $30\frac{3}{20}$.

14. Fair and pleaſant weather, with ſmall Gales at S E. *Mer.* $30\frac{3}{20}$.

15. Fair and pleaſant weather, with ſmall Gales from S to S E. In the Evening calm, *Mer.* $30\frac{2}{20}$.

16. The forenoon fair and pleaſant, with moderate Gales at S E. *Mer.* $30\frac{2}{20}$. In the afternoon overcaſt, with ſome Rain and ſmall Gales at N W. *Mer.* 30.

17. The forenoon fair and pleaſant, with moderate Gales at S E, *Mer* $30\frac{2}{20}$, the afternoon overcaſt, and the Gale refreſhning at night, *Mer*. 30.

18. Fair and pleaſant weather, ſomewhat cloudy, with ſmall Gales at S E, *Mer*. 30.

19. Cloudy weather, with a hazy Sky, and ſmall Gales at S E, *Mer*. $29\frac{18}{20}$.

20. Dry cloudy weather, with fine Gales at S E, *Mer*. $29\frac{17}{20}$.

21. Grey cloudy weather, with ſome Rain in the forenoon, and ſmall Breezes at S E, for the moſt part calm; the afternoon fair, *Mer*. 29.

22. Cloſe and cloudy weather, with hazy and calm, in the afternoon ſome Rain and ſmall Breezes at S E, *Mer*. $29\frac{16}{20}$.

23. Dry weather, ſomewhat foggy and cloudy, with ſmall Gales at S E, *Mer*. $29\frac{16}{20}$. In the Evening thick foggy weather.

24. Grey cloudy weather, ſomewhat foggy, with moderate Gales at S E, *Mer*. $29\frac{17}{20}$. At night much Fogg.

25. Cloudy and foggy weather, with fine Gales at S E, *Mer*. $29\frac{15}{20}$. At night much Rain, Thunder and Lightning, with little wind, *Mer*. $29\frac{14}{20}$.

26. Cloſe and cloudy weather, with ſmall Gales at N W. *Mer*. $29\frac{16}{20}$. In the afternoon ſomewhat hazy with ſmall drizling Rain.

27. The weather clearing up with eaſy Gales at S E. *Mer*. $29\frac{17}{20}$. The afternoon overcaſt, and in the evening much Rain with ſome Thunder and Lightning, the wind veering to N W, and back to S E $29\frac{15}{20}$.

28. Grey cloudy weather, with ſome Fogg, and ſmall Gales from W to N W. *Mer*. $29\frac{17}{20}$.

29. Cloſe and cloudy weather, with ſmall Gales from N W to N. *Mer*. $29\frac{17}{20}$. At night ſome Rain.

30. Grey cloudy weather, ſomewhat cloſe, with freſh Gales at N W. *Mer*. $29\frac{17}{20}$.

MAY. 1701.

1. A fair and ſerene Morning, with ſmall Breezes at W by S. *Mer*. $29\frac{18}{20}$. All day and night fair and pleaſant, with ſmall Breezes at N W. *Mer*. $29\frac{19}{20}$.

2. Fair and ſerene weather, with ſmall Breezes at S E, and ſometimes calm, *Mer*. 30. In the afternoon and all night freſh Gales.

3. The weather ſomewhat cloudy, with freſh Gales at S E, *Mer*. $29\frac{17}{20}$. In the afternoon falling to $29\frac{14}{20}$. The wind veering to W N W. Had much Rain with Thunder and Lightning all night.

4. The morning cloſe foggy weather, almoſt calm, *Mer*. $29\frac{17}{20}$. The afternoon clear'd up, blowing freſh from N to N E, *Mer*. $30\frac{1}{20}$.

5. Fair and pleaſant weather, ſomewhat cloudy, with moderate Gales at S E. *Mer*. 30.

6. Fair and pleaſant weather, ſomewhat cloudy, with moderate Gales at S E, *Mer*. $29\frac{12}{20}$. Towards noon little Wind. In the afternoon a

fine Gale at S E by E, and at night thick foggy weather, *Mercury* $29\frac{12}{20}$.

7. Grey cloudy weather, ſomewhat foggy, with ſmall Gales at S E, *Mer.* below $29\frac{18}{20}$.

8. Fair and pleaſant weather, ſomewhat foggy on the Hills, and ſmall variable Breezes from S W to N W, *Mer.* $29\frac{18}{20}$. At night much Fog.

9. Fair and pleaſant weather, with ſome Fog on the Hills, with ſmall variable Breezes from S W to N W, *Mer.* 30. The afternoon ſerene.

10. The forenoon fair and pleaſant, *Mer.* falling from $29\frac{18}{20}$ to $\frac{17}{20}$. The afternoon overcaſt with ſmall Gales from S to S E.

11. Grey cloudy weather, with ſmall Gales at N E, *Mer.* $29\frac{17}{20}$. In the afternoon ſome Rain.

12. Fair and pleaſant weather, ſomewhat cloudy, with ſmall Northerly Gales, *Mer.* $29\frac{18}{20}$.

13. Fair and ſerene weather, with ſmall Gales at S W. ſometimes calm, *Mer.* above $29\frac{11}{20}$.

14. Fair and ſerene weather, with ſmall Gales, variable from W to N E, *Mer.* 30. The afternoon ſomewhat overcaſt.

15. Fair and pleaſant weather, with ſmall Gales at N E, *Mer.* $29\frac{18}{20}$. At night calm.

16. Fair and ſerene weather, with ſmall Gales from N E to S E. *Mer.* falling to $29\frac{17}{20}$. In the evening overcaſt with ſome Fog.

17. The morning ſome fog on the Hills, all day fair and ſerene, with ſmall Gales at S E, *Mer.* $29\frac{18}{20}$. At night calm.

18. The Morning ſomewhat cloſe and foggy, all day fair and pleaſant with fine Gales at S E, *Mer.* 30.

19. Fair and pleaſant weather, with fine Gales at S E, *Mer.* 30.

20. Fair and pleaſant weather, with freſh Gales at S E, the Sky ſomewhat hazy, *Mer.* $29\frac{18}{20}$.

21. Grey cloudy weather, with freſh Gales at S E, *Mer.* falling below $29\frac{17}{20}$, At noon ſome ſmall Rain.

22. Cloudy hazy weather, with ſmall drizling Rains and moderate Gales at S E, *Mer.* below $29\frac{17}{20}$.

23. Cloſe and cloudy weather, with moderate Gales at S E, *Mercury* $29\frac{16}{20}$.

24. Thick hazy weather, with continual Rain, and freſh Gales from N N E to S E, *Mer.* falling below $29\frac{12}{20}$.

25. Cloſe and cloudy weather, with moderate Gales from E to N E. *Mer.* $29\frac{13}{20}$.

26. The forenoon thick hazy weather, and the afternoon grey cloudy weather, with ſmall Gales at N E, *Mer.* riſing above $29\frac{14}{20}$.

27. Grey cloudy weather, with moderate Gales at S E, *Mer.* above $29\frac{15}{20}$. Some Rain at night.

28. Grey cloudy weather, with the wind from S E to S S E, ſometimes ſmall Gales, and ſometimes blowing freſh, *Mer.* $29\frac{15}{20}$. Rain at night.

29. Grey cloudy weather, with fine Gales at S E, and drizling Rains, *Mer.* $29\frac{15}{20}$. At night ſmall Gales at N E, ſometimes calm with thick weather.

30. Thick foggy weather, for the moſt part calm, and ſmall drizling Rains, *Mer.* $29\frac{13}{20}$. At night ſmall Gales at S E.

31. Grey cloudy weather, ſomewhat foggy, with ſmall Gales at S E, *Mer.* $29\frac{18}{20}$. At night ſome Rain.

J U N E, 1701.

1. Grey cloudy and foggy weather, with ſome Rain in the forenoon, and ſmall Gales at W. *Mer.* $29\frac{13}{20}$. In the afternoon, riſing to $29\frac{15}{20}$. The wind veering to N, and the weather clearing up.

2. The forenoon fair and pleaſant weather and calm, *Mer.* $29\frac{17}{20}$. The afternoon overcaſt, with ſome ſmall Rain, and ſmall Gales at S E, *Mer.* falling below $29\frac{16}{20}$. At night ſome Rain.

3. All this forenoon cloſe thick Rainy weather, with ſmall Gales at N E, *Mer.* falling below $29\frac{13}{20}$. The afternoon dry, cloudy and calm.

4. Fair and pleaſant weather, with fine freſh Gales from S E to S S E, *Mer.* above $29\frac{14}{20}$.

5. Fair and ſerene weather, very hot, with ſmall Gales from W S W, to N W. *Mer.* above $29\frac{15}{20}$.

6. Fair and ſerene weather, with variable Gales round the Compaſs, *Mer.* $29\frac{17}{20}$. The afternoon ſomewhat cloudy, and at night calm.

7. The forenoon overcaſt and foggy, with ſmall Gales at S E, and ſince noon drizling Rains, *Mer.* falling to $29\frac{14}{20}$. Much Rain in the night, blowing in Guſts.

8. Cloſe hazy weather, with drizling Rains all day, and ſmall variable Breezes, for the moſt part calm, *Mer.* $29\frac{13}{20}$. At night fair.

9. This morning clearing up, with ſome drops of Rain and calm, *Mer.* riſing to $29\frac{16}{20}$. The afternoon overcaſt, and ſome Rain in the Evening.

10. Grey cloudy weather, ſomewhat foggy, with ſmall Gales at S E, ſometimes calm, *Mer.* $29\frac{18}{20}$. The afternoon and night drizling Rains.

11. This morning cloudy and foggy, with drizling Rains and calm, *Mer.* below $29\frac{18}{20}$. The afternoon cloſe and foggy; with drizling Rains and ſmall Gales from E S E to S E, *Mer.* falling to $29\frac{14}{20}$.

12. Cloſe foggy weather, with little Wind at S E, and ſometimes calm, *Mer.* $29\frac{13}{20}$. The afternoon and all night very much Rain.

13. Cloſe foggy weather, with much Rain in the forenoon, and drizling in the afternoon, with ſmall variable Breezes, ſometimes calm, *Mer.* $29\frac{13}{20}$.

14. The morning cloſe and foggy, the forenoon clear'd up, with fair and pleaſant weather, and ſmall Breezes at S W. *Mer.* $29\frac{14}{20}$. The afternoon overcaſt, with ſmall Gales at S E. In the evening ſome vehement Thunder, with Lightning and much Rain, *Mer.* below $29\frac{14}{20}$.

15. The forenoon cloſe foggy weather, the afternoon grey and cloudy with ſmall Gales from S E to N E, ſometimes calm, *Mer.* below $29\frac{14}{20}$.

16. The forenoon cloſe and foggy, with ſome Rain; at noon cleared up with ſmall Gales from S E. *Mer.* above $29\frac{13}{20}$. At night cloudy with ſome Lightning.

17. The morning very hazy and calm, the forenoon cleared up with ſmall Gales at S E, *Mer.* above $29\frac{14}{20}$. The afternoon overcaſt, with the Gale veering to N by E, much Rain, Thunder and Lightning. *Mer.* as before.

18. Grey cloudy weather in the morning, and clear'd up in the afternoon, with ſmall Gales at S E, *Mer.* $29\frac{16}{20}$. The afternoon overcaſt with freſh Gales continuing all night, *Mer.* as before.

19. This forenoon grey cloudy weather, ſometimes clearing up, with freſh Gales at S E, *Mer.* $29\frac{16}{20}$.

20. Fair and cloudy weather, with moderate Gales at S E, *Mer.* $29\frac{17}{20}$.

21. The forenoon fair and ſomewhat cloudy, the afternoon ſerene and pleaſant, with ſmall Gales at S E, *Mer.* below $29\frac{16}{20}$.

22. The forenoon fair and pleaſant, with fine Gales at S E, *Mer.* below $29\frac{16}{20}$. The afternoon grey and cloudy, with little wind.

23. Fair and pleaſant weather, with ſmall Breezes at S E, for the moſt part calm, with ſome Lightning in the night, *Mer.* $29\frac{16}{20}$.

24. Fair and pleaſant weather, with ſmall Gales at S E, ſometimes calm, *Mer.* $29\frac{16}{20}$. At night overcaſt, and calm with ſome Lightning.

25. Fair and ſerene weather, with ſmall Gales from S E in the forenoon, *Mer.* $29\frac{16}{20}$. The afternoon fine freſh Gales from S E to S by F, and blowing very freſh all night.

26. Fair and pleaſant weather, blowing very freſh from S by E to S by W. about noon little wind, *Mer.* below $29\frac{16}{20}$. The afternoon moderate Gales at S E.

27. Fair and ſerene weather, with moderate Gales at S E. *Mer.* below $29\frac{16}{20}$

28. Fair and ſerene weather, with moderate Gales at S E, *Mer.* as before.

29. Fair and ſerene weather, with fine Gales at S E, *Mer.* $29\frac{14}{20}$. The evening overcaſt and blowing freſh all night.

30. Cloudy weather, ſomewhat hazy, with freſh Gales from E S E to N E, *Mer.* below $29\frac{14}{20}$. The afternoon much Rain and blowing hard all night at S E, *Mer.* $29\frac{12}{20}$.

JULY. 1701.

1. Cloudy and hazy weather, with ſome Rain and hard Gales at S E *Mer.* $29\frac{12}{20}$.

2. The Forenoon fair and ſomewhat Cloudy, the afternoon ſerene, with fine freſh Gales at S E, *Mer.* below $29\frac{11}{20}$. All night cloudy.

3. Dry weather, ſomewhat Cloudy, with fine Gales at S E, *Mercury* $29\frac{14}{20}$.

4. Fair and ſerene weather, with fine freſh Gales at S E, *Mer.* 29 $\frac{14}{20}$. The evening overcaſt.

5. Fair and pleaſant weather, ſomewhat cloudy, with a ſmall ſhower in the forenoon, ſome Thunder and eaſy Gales at S E, *Mer.* above 29 $\frac{15}{20}$. At night little wind.

6. Fair and ſerene weather, with ſmall gales at S E, *Mer.* 29 $\frac{14}{20}$. At night little Wind.

7. Fair and pleaſant weather, ſomewhat cloudy, with fine Gales at S E, *Mer.* 29 $\frac{14}{20}$.

8. The Forenoon overcaſt, with ſome Rain and Guſts of Wind at S E, the afternoon fair and pleaſant, with eaſy Gales at S E, *Mer.* above 29 $\frac{13}{20}$. At night ſome ſmall Rain.

9. Fair and pleaſant weather, ſometimes cloudy, with fine Gales at S E, *Mer.* above 29 $\frac{13}{20}$.

10. The morning ſomewhat hazy and cloudy, all day fair and ſerene weather, with eaſy Gales S E. *Mer.* below 29 $\frac{13}{20}$.

11. Fair and pleaſant Weather, with ſmall Gales at S E, *Mercury* below 29 $\frac{12}{20}$. The afternoon overcaſt and little Wind, *Mercury* falling to 29 $\frac{11}{20}$. Some Thunder and Lightning.

12. The forenoon fair and pleaſant, with ſmall Gales at S E, *Mercury* below 29 $\frac{10}{20}$. The afternoon overcaſt, with ſeveral ſmall Showers of Rain and little Wind, all night calm.

13. Fair and pleaſant weather, with ſome Clouds and calm, *Mer.* 29 $\frac{12}{20}$. Towards noon overcaſt, and the Wind in ſmall Gales veering to S W, with cloſe Rainy weather all the afternoon, in the evening dry and cloudy, with ſmall Gales at W, *Mercury* 29 $\frac{14}{20}$.

14. This morning and forenoon cloſe and cloudy Weather, with much Rain and ſmall Gales at W. *Mercury* 29 $\frac{14}{20}$. The afternoon dry and cloudy, the Wind and *Mercury* as before.

15. Fair and pleaſant Weather, with ſmall Breezes from W to S W, ſometimes calm, *Mercury* 29 $\frac{16}{20}$.

16. Dry cloudy weather, with ſmall Gales at S E, *Mer.* 29 $\frac{14}{20}$.

17. Fair and pleaſant weather, ſometimes cloudy, with fine freſh Gales at S E by S. *Mercury* above 29 $\frac{1}{2}{}^{4}$.

18. Fair and pleaſant weather, ſometimes overcaſt, with freſh Gales at S E. At night blowing very hard, *Mercury* 29 $\frac{16}{20}$.

19. Fair and pleaſant weather, with ſmall Gales at S E, *Mercury* 29 $\frac{16}{20}$.

20. Fair and ſerene weather, with fine freſh Gales in the forenoon, and fine freſh Gales in the afternoon, *Mercury* 29 $\frac{15}{20}$. At night calm.

21. Fair and ſerene weather, with fine Gales at S E, *Mercury* 29 $\frac{15}{20}$.

22. Fair and ſerene weather, with fine Gales at S E, *Mercury* 29 $\frac{15}{20}$. At night ſometimes little Wind, at other times blowing freſh.

24. Fair and ſerene weather, with fine Gales at S E, *Mercury* 29 $\frac{16}{20}$. Afternoon blowing freſh.

25. Very fair and ſerene Weather, with ſmall Gales at S E, *Mercury* 29 $\frac{17}{20}$. At night ſome Lightning.

26. Grey cloudy weather, with ſmall Gales at S E, at night calm and ſome Lightning.

27. Grey cloudy weather, with ſmall Gales at NNW in the forenoon, and veering to N E in the afternoon, *Mercury* $29\frac{14}{20}$. At evening much overcaſt, with Thunder and Lightning and ſome Rain.

28. Fair and pleaſant weather, ſomewhat cloudy, with ſmall variable Gales from N W to N E, *Mercury* $29\frac{15}{20}$.

29. Grey cloudy Weather, with ſmall variable Gales from N E to S W, ſometimes calm, *Mercury* $29\frac{15}{20}$. In the evening a ſmall Shower of Rain, with ſome Thunder and Lightning.

30. Fair and ſerene Weather and calm, *Mercury* $29\frac{17}{20}$. In the afternoon ſmall Gales at N N W, very hot and ſultry. At night little Wind, with ſome Thunder and Lightning.

31. Fair and pleaſant Weather, ſometimes cloudy, with fine Gales at S E, *Mercury* $29\frac{16}{20}$. Some Thunder and Lightning in the afternoon.

AUGUST, 1701.

1. The Morning ſomewhat overcaſt, all Day fair and pleaſant, with ſmall Gales at SE, *Mercury* $29\frac{16}{20}$. The afternoon fine Gales.

2. Very fair and ſerene Weather, with fine Gales at S E, *Mer.* $29\frac{17}{20}$.

3. Fair and ſerene Weather, with fine Gales at S E, *Mercury* $29\frac{18}{20}$.

4. Fair and ſerene Weather, with fine Gales at S E *Mer.* $29\frac{18}{20}$.

5. The forenoon grey cloudy Weather and calm, the afternoon ſerene with ſmall Gales at S E by E, *Mercury* $29\frac{18}{20}$.

6. Fair and ſerene Weather, with ſmall Gales at N N W, *Mercury* $29\frac{16}{20}$. The evening overcaſt with ſome Lightning.

7. Fair Weather, ſometimes overcaſt, with freſh Gales from S to S S E, *Mercury* $29\frac{17}{20}$.

8. Fair and pleaſant Weather in the forenoon, and cloudy in the afternoon, with ſmall Gales at S S E, *Mer.* $29\frac{16}{20}$.

9. Fair and ſerene Weather, with ſmall Gales in the forenoon, and freſhning in the afternoon S E, $29\frac{19}{20}$.

10. Fair and ſerene Weather, with ſmall Gales from S E to E by S. *Mercury* $29\frac{18}{20}$. At night calm.

11. Fair and ſerene Weather, calm in the forenoon, and ſmall variable Gales in the afternoon, and Lightning at Night, *Mer.* $29\frac{18}{20}$.

12. Fair and ſerene Weather, with ſmall Gales at S S E, at Night calm and hazy, *Mer.* $29\frac{17}{20}$.

13. Fair and ſerene Weather, calm in the forenoon, and ſmall variable Breezes in the Afternoon, *Mercury* $29\frac{18}{20}$.

14. Fair Weather, ſometimes overcaſt, with ſmall Gales at N W by W. *Mercury* $29\frac{15}{20}$.

15. Fair Weather, ſomewhat cloſe, and ſome Rain in the afternoon, with ſmall variable Gales, *Mercury* $29\frac{15}{20}$.

16. Fair and ſerene Weather, calm in the forenoon, and ſmall variable Breezes in the afternoon, *Mercury* $29\frac{15}{20}$.

17. The Weather cloudy and overcaſt, with ſome Rain in the afternoon, and ſmall variable Gales round the Compaſs, *Mercury* $29\frac{16}{20}$.

18. Grey cloudy Weather, with ſome Rain, and eaſy Gales at N E, *Mercury* $29\frac{16}{20}$. In the night very freſh Gales from N E to S E, and ſometimes at N W.

19. Grey cloudy Weather, with ſome Rain, and freſh Gales from S E to E S E, *Mercury* $29\frac{15}{20}$.

20. Fair and pleaſant Weather, with fine Gales at S E, *Mer.* $29\frac{16}{20}$.

21. Fair and pleaſant, with fine Gales at S E, *Mer.* $29\frac{16}{20}$.

22. Fair and ſerene Weather, with ſmall Gales at S E, *Mercury* $29\frac{18}{20}$.

23. Fair and pleaſant Weather, with ſmall Gales at S E, in the afternoon ſomewhat cloudy and the Gale freſhning, *Mercury* $29\frac{18}{20}$. In the night blew very freſh.

24. Fair and ſerene Weather, with moderate Gales at S E. In the evening much overcaſt, and at Night much Rain with ſome Thunder and Lightning. The Wind at N W. *Mercury* $29\frac{15}{20}$.

25. The Morning grey and cloudy, all day fair and pleaſant, with ſmall Gales at N W, in the afternoon veering to S E, and at Night calm, *Mercury* $29\frac{16}{20}$.

26. Fair and pleaſant Weather, with ſmall Gales at S E, *Mercury* $29\frac{16}{20}$.

27. Grey cloudy Weather, with drizling Rains this Morning and Forenoon; and fair in the Afternoon, with ſmall variable Gales, *Mer.* $29\frac{15}{20}$.

28. Fair and pleaſant Weather, with ſmall Gales from N to N E, *Mer.* $29\frac{17}{20}$. At Night calm.

29. Fair and pleaſant Weather, with ſmall Gales at N E, *Mercury* $29\frac{17}{20}$. At Night ſome drizling Rain.

30. Fair and pleaſant Weather, ſomewhat cloudy, with eaſy Gales at N E, *Mercury* $29\frac{16}{20}$.

31. Grey cloudy Weather, with ſome Rain, and moderate Gales at N E, in the Night blowing in Guſts, *Mercury* $29\frac{14}{20}$.

SEPTEMBER. 1701.

1. Fair Weather, ſometimes overcaſt, with freſh Gales from N to N W, *Mercury* $29\frac{14}{20}$.

2. Cloudy Weather, with ſome Rain, and bluſtering Gales at N N W, *Mercury* $29\frac{15}{20}$.

3. Fair and pleaſant Weather, with moderate Gales at N N W, ſometimes overcaſt and blowing freſh; at Night little Wind, *Mercury* $29\frac{16}{20}$.

4. Fair and pleaſant Weather, with ſmall Gales from N W to N. At Night calm, *Mercury* $29\frac{18}{20}$.

5. Fair and pleaſant Weather, with ſmall Gales at N, *Mer.* $29\frac{18}{20}$.

6. Fair and pleaſant Weather, with ſmall Gales at N and N by W. *Mercury* $29\frac{18}{20}$.

7. Fair and pleaſant Weather, with ſmall Gales at N by W and NNW. *Mercury* below $29\frac{18}{20}$.

8. Fair and pleaſant Weather, with ſmall Gales at N N W. *Mercury* below $29\frac{18}{20}$.

9. Fair and ſerene Weather, with ſmall Gales at N. *Mercury* $29\frac{18}{20}$.

10. Fair and ſerene Weather, with ſmall Gales at N, *Mercury* $29\frac{18}{20}$.

11. Fair and ſerene Weather, with ſmall Gales at S E, and at Night veering to E N E, *Mercury* $29\frac{18}{20}$.

12. Fair and ſerene Weather, with ſmall Gales at SS E, *Mer.* $29\frac{18}{20}$.

13. The forenoon fair and pleaſant, the Afternoon grey cloudy Weather, with ſmall Gales at E S E, *Mercury* 30.

14. Grey cloudy Weather, with ſmall Gales from E S E to E N E, ſometimes calm, *Mer.* 30. In the Night variable Gales with ſome Rain.

15. Grey cloudy Weather, with ſmall Gales from N E to S E by E *Mercury* 30.

16. The Morning cloudy and overcaſt, all Day clear'd up, with eaſy Gales at S E, *Mercury* 30.

17. Fair and ſerene Weather, with moderate Gales at S E. *Mer.* 30.

18. Fair and ſerene Weather, with moderate Gales at S E *Mer.* 30.

19. Fair and ſerene Weather, with ſmall Gales at S E. *Mercury* $29\frac{12}{20}$.

20. Cloſe hazy Weather, with ſmall Gales from N E, *Mercury* $30\frac{1}{20}$. In the afternoon ſome Rain.

21. Grey cloudy Weather, with moderate Gales at N by E and NNE. *Mercury* $30\frac{3}{20}$. In the evening little Wind.

22. Dry temperate Weather, ſomewhat grey and cloudy, with ſmall Gales at N by W. *Mercury* $30\frac{5}{20}$.

23. Fair and pleaſant Weather, ſomewhat cloudy, with ſmall Gales at N N W. *Mercury* $30\frac{4}{20}$.

24. Fair and pleaſant Weather, with ſmall Gales at N N W. *Mercury* $30\frac{2}{20}$.

25. Fair and pleaſant Weather, with ſmall Gales at N N W. *Mer.* $30\frac{1}{20}$.

26. Fair Weather, ſomewhat cloudy, in the afternoon ſome Showers of Rain, and ſmall Gales from N N W to N W by W, *Mer.* $30\frac{2}{20}$, riſing at Night to $30\frac{4}{20}$.

27. Fair and cloudy Weather, with ſmall Gales from N N W to N. *Mercury* $30\frac{4}{20}$.

28. Fair and pleaſant Weather, with ſmall Gales from N by W to N by E.

29. Dry and cloudy Weather, with ſmall Gales at N N W.

30. Fair and pleaſant Weather in the forenoon, with ſmall Gales at N N E, the afternoon overcaſt with Guſts of Wind and ſome Showers of Rain.

OCTOBER. 1701.

1. The Morning overcaſt, all Day fair and pleaſant, with ſmall Gales from N N E to N.

2. The Morning grey and cloudy, all Day fair and pleaſant, with ſmall Gales at N by W.

3. Grey cloudy Weather, with moderate Gales at N and N by E, ſometimes blowing freſh; at night thick and hazy with ſome Rain.

4. Thick hazy Weather, towards Noon clear'd up, afternoon overcaſt with Rain and dark Weather. Small Gales at N N E.

5. Grey cloudy Weather, with ſmall Gales at N N E, inclining to Rain.

6. Thick hazy Weather, with much Rain and ſmall Gales at N N E. *Mer.* below 30.

7. The Morning cloſe and cloudy Weather, with ſome Rain, and ſmall Gales at N and N by W. *Mercury* below 30. All Day thick hazy Weather, with drizling Rains.

8. Hazy Weather, with drizling Rains and ſmall Gales at N N E and N E, *Mer.* 30 $\frac{3}{20}$.

9. Cloſe hazy Weather, with drizling Rains, and ſmall Gales at N E, *Mer.* 30 $\frac{4}{20}$. at Night 30 $\frac{5}{20}$.

10. Cloſe and cloudy Weather, with ſome Rain, and moderate Gales at N E, *Mer.* 30 $\frac{5}{20}$.

11. Grey cloudy Weather, with ſome Rain at Night, and ſmall Gales at N N E, *Mercury* 30 $\frac{6}{20}$.

12. The Morning ſerene, with ſmall Gales at N E, *Mer.* 30 $\frac{7}{20}$. The afternoon grey cloudy Weather, *Mer.* 30 $\frac{6}{20}$.

13. Dry cloudy Weather, with ſmall Gales at N by E, *Mercury* 30 $\frac{6}{20}$. The afternoon more ſerene and almoſt calm.

14. Grey cloudy Weather, with moderate Gales at N E, ſometimes blowing freſh, *Mercury* 30 $\frac{2}{2}$..

15. Grey cloudy Weather, inclining to Rain, with moderate Gales at N by W, *Mercury* 30 $\frac{2}{20}$. At Night much Rain.

16. Grey cloudy Weather, with ſome Rain at Night, and freſh Gales at N and N by W, *Mercury* 30 $\frac{4}{20}$.

17. Grey cloudy Weather, with moderate Gales at N by E, blowing freſh in the night at N N W. *Mercury* 30 $\frac{4}{2}$.

18. Fair and pleaſant weather, with moderate Gales at N W by N. *Mercury* 30 $\frac{5}{20}$.

19. Fair and ſerene weather, with ſmall Gales at N W. *Mer.* 30 $\frac{6}{20}$.

20. Fair and ſerene weather, with ſmall Gales at W N W and W by N. *Mercury* 30 $\frac{6}{20}$.

21. Fair and ſerene weather, with ſmall Gales at N E and N E by E, *Mer.* 30 $\frac{6}{20}$.

22. Fair and ſerene weather, with ſmall Gales at N and N by E, *Mer.* $30\frac{6}{20}$.

23. Fair and ſerene weather, with ſmall Northerly Breezes, ſometimes calm, *Mercury* $30\frac{3}{20}$.

24. A grey cloudy Morning, blowing freſh at N N W. All Day fair and pleaſant, with moderate gales at N. *Mercury* $30\frac{5}{20}$.

25. The forenoon overcaſt with fine freſh gales W N W, and ſharp weather, the afternoon more ſerene and ſmaller Gales, *Mercury* $30\frac{7}{20}$.

26. Fair and ſerene weather, with fine ſharp gales at N N W. *Merc.* $30\frac{8}{20}$.

27. Fair and ſerene weather, with ſmall gales at E S E and S E, ſometimes calm, *Mercury* $30\frac{6}{20}$.

28. Grey cloudy weather, with freſh gales at N N W and N. *Mercury* $30\frac{8}{20}$.

29. Fair weather, ſomewhat cloudy with moderate gales from N by W to N W, *Mer.* $30\frac{8}{20}$.

30. Grey cloudy weather, with moderate Gales at N W, *Mercury* $30\frac{8}{20}$.

31. Fair and ſerene weather, with moderate gales at N by W and N. *Mercury* $30\frac{1}{20}$. Very cold.

NOVEMBER. 1701.

1. Fair and ſerene weather, with ſmall gales W N W. *Mercury* $30\frac{6}{20}$.

2. Grey cloudy weather, with ſome Rain in the evening, and moderate gales at N N W. *Mercury* $30\frac{5}{20}$.

3. Fair and ſerene weather, ſomewhat hazy with very freſh gales at N by W and N N W, *Mercury* below $30\frac{6}{20}$.

4. Fair and ſerene weather, with ſmall Breezes at N by E, *Mercury* $30\frac{6}{20}$. At night calm.

5. Fair and ſerene weather, with ſmall Breezes at S E. Sometimes calm, *Mercury* $30\frac{6}{20}$.

6. Fair and ſerene weather, with ſmall Breezes from WSW to WNW, *Mercury* $30\frac{5}{20}$.

7. Fair and ſerene weather, with ſmall gales at N W. *Mercury* $30\frac{6}{20}$.

8. This Morning foggy; all day ſerene, with moderate gales from S W to N W, *Mercury* $30\frac{6}{20}$.

9. Fair and pleaſant weather, ſometimes overcaſt, with moderate gales at S E and E S E, *Mer.* $30\frac{4}{20}$. At night little wind and calm.

10. Fair and ſerene weather, with moderate gales at S E, *Mer.* $30\frac{5}{20}$.

11. Grey cloudy weather, with ſmall gales at N and N by W. In the evening calm, *Mer.* $30\frac{2}{20}$.

12. Fair and pleaſant weather, with ſmall gales at N. In the evening calm, *Mercury* $30\frac{4}{20}$.

13. Fair and pleaſant weather, with ſmall gales from S by E to S E, *Mercury* $30\frac{4}{20}$. At night calm.

14. Grey and cloudy weather, ſomewhat hazy, with moderate gales from W N W to N W, *Mercury* $30\frac{5}{20}$.

15. Grey cloudy weather, with freſh gales at N N E, and ſome ſmall Rain, *Mer.* $30\frac{5}{20}$.

16. Fair and pleaſant weather, with moderate gales from S to S E, *Mer.* $30\frac{6}{20}$.

17. Grey cloudy weather, with moderate gales from S by W to E S E, *Mercury* $30\frac{5}{20}$. At night blowing hard and veering to N W, with much Rain.

18. Grey cloudy weather, with freſh gales at N W. In the afternoon blowing very hard, *Mercury* 30.

19. Grey cloudy weather, with moderate gales at N W. *Mer.* $30\frac{5}{20}$. At night riſing to $30\frac{10}{20}$.

20. Fair and pleaſant weather, with ſmall gales from N to E, and about to S E. In the evening little wind, *Mer.* $30\frac{10}{20}$, falling to $30\frac{6}{20}$.

21. Grey cloudy weather, for the moſt part calm, with ſmall Northerly Breezes, *Mercury* $30\frac{6}{20}$.

22. Grey cloudy weather, with moderate gales at N W. *Mer.* $30\frac{6}{20}$.

23. Grey cloudy weather, with fine gales at N W. *Mer.* $30\frac{6}{20}$.

24. Grey cloudy weather, with eaſy gales from W N W to N W. *Mercury* $30\frac{8}{20}$.

25. Grey and cloudy weather, with eaſy gales at N W, *Mercury* $30\frac{6}{20}$.

26. Fair and ſerene weather, with ſmall Gales at N W, ſometimes calm, *Mercury* $30\frac{6}{20}$.

27. Thick hazy weather, with drizling Rains, and at night much Rain, with ſmall Southerly Breezes, for the moſt part calm, *Mer.* $30\frac{2}{20}$.

28. Hazy weather, with drizling Rains all day and night, and ſmall gales from N to N N E, *Mer.* $30\frac{1}{20}$, riſing to $30\frac{3}{20}$.

29. Grey cloudy weather, with ſmall gales at N N E, *Mer.* $30\frac{5}{20}$.

30. Grey cloudy weather, with fine gales at N. *Mercury* $30\frac{8}{20}$.

DECEMBER. 1701.

1. Grey cloudy weather, and very cold with fine gales at N. *Mer.* $30\frac{12}{20}$. Some froſt at night.

2. Dry weather, ſomewhat cloudy, with moderate Gales at N N W, *Mercury* $30\frac{8}{20}$.

3. Fair and ſerene weather, with ſmall Gales at N W, *Mercury* $30\frac{6}{20}$.

4. Fair and ſerene weather, with ſmall gales at N W and W N W, *Mercury* $30\frac{6}{20}$. At night overcaſt.

5. Dry cloudy weather, with moderate gales at N by W, *Mer.* $30\frac{9}{20}$.

6. Fair and pleaſant weather, with fine gales from E to S E, and at night calm, *Mer.* $30\frac{7}{20}$, falling to $30\frac{5}{20}$.

7. Grey cloudy weather, with freſh gales at N W and W N W, *Mer.* $30\frac{8}{20}$.

8. Fair weather, ſomewhat cloudy, with freſh Gales at N W *Mercury* 30 $\frac{12}{20}$.

9. Fair and pleaſant weather, with fine Gales at N N W, *Mercury* 30 $\frac{11}{20}$.

10. Fair and ſerene weather, with ſmall Gales at N W to N, *Mercury* 30 $\frac{11}{20}$. At night calm.

11. Fair and ſerene weather, with ſmall Gales at N W, *Mer.* 30 $\frac{1}{20}$.

12. Fair and ſerene weather, ſometimes cloudy, with ſmall Gales at N W, *Mercury* 30 $\frac{9}{20}$.

13. Fair and ſerene weather, with ſmall Gales at N W, *Mercury* 30 $\frac{7}{20}$. At night calm.

14. Fair and ſerene weather, with ſmall Gales at N W. *Mercury* 30 $\frac{6}{20}$. At night calm.

15. Fair and ſerene weather, with ſmall Gales at S S W. *Mercury* 30 $\frac{18}{20}$. At night the Gale freſhned from S S E.

16. Grey cloudy weather, with moderate Gales at S E, *Mercury* 30 $\frac{6}{20}$ At night ſome Rain.

17. Grey cloudy weather, with drizling Rains, and ſmall Gales at N W, *Mercury* 30 $\frac{5}{20}$. At night calm.

18. Grey cloudy weather, with moderate Gales at N W, *Mercury* 30 $\frac{6}{20}$. Some Slite in the night.

19. Grey cloudy weather, with moderate Gales at N W, *Mer.* 30 $\frac{5}{20}$.

20. Fair and ſerene weather, with ſmall Gales at N W. *Mercury* 30 $\frac{5}{20}$. At night 30 $\frac{4}{20}$.

21. The forenoon ſomewhat hazy and calm, *Mercury* 30 $\frac{5}{20}$. The afternoon ſerene, with ſmall Gales at N W, *Mercury* 30 $\frac{6}{20}$.

22. Fair and ſerene weather, freezing, with freſh Gales at N N W, *Mercury* 30 $\frac{11}{20}$.

23. Serene weather, freezing hard, with freſh Gales at N N W. *Mercury* 30 $\frac{14}{20}$. At night little Wind.

24. Serene weather, freezing hard, with moderate Gales at W N W. *Mercury* 30 $\frac{12}{20}$.

25. Fair froſty weather, with moderate Gales at N W, *Mer.* 30 $\frac{10}{20}$.

26. Fair froſty weather, with ſmall Gales from W N W to N N W, *Mercury* 30 $\frac{10}{20}$. At night Fog.

27. Fair and ſerene weather, freezing with little Wind at N NW, for the moſt part calm, *Mercury* 30 $\frac{2}{20}$.

28. Fair and ſerene weather, freezing with ſmall Breezes at N, and ſometimes calm, *Mercury* 30 $\frac{8}{20}$.

29. Fair and ſerene weather, with ſmall Northerly Breezes, for the moſt part calm, *Mercury* 30 $\frac{6}{20}$. At night ſome Wind and Rain.

30. The Morning foggy, all day fair and pleaſant, with ſmall Gales from S E to E by S, *Mercury* 30 $\frac{4}{20}$.

31. Cloſe and cloudy weather, with drizling Rains, for the moſt part calm, *Mercury* 30 $\frac{2}{20}$.

JANUARY, 1702.

1. Thick hazy weather, with drizling Rains, for the moſt part calm, with ſmall variable Breezes, *Mercury* $30\frac{2}{20}$.

2. Grey cloudy weather, with ſome Rain, and ſmall Gales at N E, *Mercury* $30\frac{4}{20}$.

3. Grey cloudy weather, with ſmall Gales at N and N NW, *Mer.* $30\frac{8}{20}$.

4. Grey cloudy weather, with ſmall Northerly Gales, *Mer.* $30\frac{2}{20}$.

5. Grey cloudy weather, with ſmall Northerly Gales, *Mercury* $30\frac{6}{20}$. Afternoon and night ſerene.

6. Fair and pleaſant weather, with moderate Gales at S E. In the Evening and all Night calm, *Mercury* $30\frac{2}{20}$.

7. Cloſe and hazy weather, with ſmall Gales at E S E and S E, ſometimes calm, *Mer.* $30\frac{2}{20}$.

8. Cloſe and cloudy, in the Morning little Wind, towards noon blowing ſomewhat freſh at N N W, and in the Evening moderate, *Mercury* $30\frac{2}{20}$, riſing to $30\frac{6}{20}$.

9. Grey cloudy weather, with ſmall northerly Gales, *Mercury* $30\frac{4}{20}$.

10. Grey cloudy weather, with ſmall variable Gales, ſometimes calm, *Mercury* $30\frac{4}{20}$.

11. Fair and ſerene weather, with ſmall Breezes at S E, *Mercury* $30\frac{5}{20}$.

12. The weather overcaſt, with moderate Gales at W N W, *Mer.* $30\frac{6}{20}$.

13. Fair and pleaſant weather, with moderate Gales at N W, *Mercury* $30\frac{10}{20}$.

14. Fair and ſerene weather, with ſmall Gales at N, *Mercury* $30\frac{10}{20}$.

15. Fair and ſerene weather, with ſmall Gales at S E, *Mer.* $30\frac{8}{20}$.

16. Grey cloudy weather, with ſmall Gales from S S W to S E. The afternoon cloſe and hazy, with ſome Rain, *Mercury* $30\frac{2}{20}$.

17. Cloſe hazy weather, with moderate Gales from N W to N by W, *Mercury* $30\frac{2}{20}$. At night little Wind. *The* Chineſe *New Year begun this Day*.

18. Cloſe and cloudy weather and calm, *Mercury* $30\frac{2}{20}$. The afternoon ſmall drizling Rains.

19. Grey cloudy weather, with freſh Gales at N by W, and a little Snow, *Mercury* $30\frac{6}{20}$.

20. Grey cloudy weather, with ſmall Gales at N W, the afternoon ſerene, and freezing hard at night, *Mer.* $30\frac{6}{20}$.

21. Fair and ſerene Weather, freezing, with ſmall Gales at N N W, for the moſt part calm, *Mercury* above $30\frac{6}{20}$.

22. Fair and ſerene weather, freezing hard, with ſmall Northerly Breezes, for the moſt part calm, *Mercury* $30\frac{8}{20}$.

23. Grey cloudy weather and calm, *Mercury* $30\frac{6}{20}$.

24. Cloſe hazy weather, with drizling Rains and calm, *Mer.* $30\frac{7}{20}$.

25. Grey cloudy weather, with ſmall Gales at N E, *Mercury* $30\frac{6}{20}$. At night little Wind and ſome Rain.

26. Cloſe and cloudy Weather, with ſmall Gales at N E, *Mercury* 30 $\frac{8}{20}$. At night calm, *Mercury* 30 $\frac{2}{20}$.

27. Thick hazy weather, with drizling Rains and ſmall Gales at N by E, *Mercury* 30 $\frac{1}{20}$, blowing freſh at night.

28. Grey cloudy weather, with freſh Gales at N N W, *Mer.* 30 $\frac{6}{20}$. At night 30 $\frac{8}{20}$.

29. Grey cloudy weather, with fine gales at N W, *Mer.* 30 $\frac{6}{20}$.

30. Fair and pleaſant weather, with moderate gales at N W. *Mercury* 30 $\frac{7}{20}$.

31. Fair and ſerene weather, with ſmall gales at N W. *Mer.* 30 $\frac{6}{20}$.

Rain at Upminſter, *for 18 Years, to* 1714. *by Mr.* Derham, *n.* 341. *p.* 130.

XIII. Laſt Year having been ſo remarkably dry, that Ponds near *Upminſter*, are for the moſt part dry, and Springs generally very low or quite failing, I had the Curioſity to make an Extract (out of my Regiſters of the Weather, *&c.*) of the *Quantity of Rain* which fell at *Upminſter* the laſt 18 Years. The Particulars of which, every Year, may be ſeen in the following Table. In one Column of which, the Weight of the Rain in Pounds *Troy* and Centeſimals of Pounds, may be ſeen; in the other, the Depth of it in Inches and Centeſimals of Inches, or what Height it would have been, had it not been imbibed by the Earth, or leſſened by Exhalations, but been ſuffered to have ſtagnated on the Ground.

Among the *dry Years*, 1704 was complained of for one; which the News-Papers reported to have been ſo conſiderable at *Venice*, that they were forced to fetch their Water in Barks five Leagues off, as far as the *Brenta*; ſo that publick Prayers were put up for Rain. Yet we may obſerve that ſeveral other Years were drier than that with us at *Upminſter*. But among them all, none comparable to the laſt Year 1714. In which the whole Quantity of Rain was no more than 55 *l.* 95 Hundredths, or eleven Inches nineteen hundredths; whereas the leaſt Quantity of any of the preceeding 18 Years, exceeded 15 Inches in Depth.

What Effects this Drought hath had in the Bodies of Animals, I leave others to judge. It is well known how contagious and fatal a Diſtemper hath raged among not only our Black Cattle, but in many other Parts of *Europe*. And I obſerved the *Itch* was epidemical among the poorer ſort, at the beginning of the Year; that the *Meaſles* were very common, ſome Parts of the Year; and that *Pleuriſies* and *Malignant Feavers* infeſted a great many, eſpecially in the Summer Months.

—*At* Paris *for* 23 *Years, ib. p.* 132.

2. We have collected out of the *Memoirs* of the *Royal Academy* of *Sciences*, the Quantity of *Rain* and diſſolved *Snow* which has fallen at the *Obſervatory* at *Paris* for 23 Years together; according to the accurate Obſervation of M. *De la Hire*. And that the Compariſon might be made more juſtly, we have reduced the *French* Meaſure to our own. But it is to be obſerved, that the Diverſity of Stile makes the Years not exactly the ſame, though, as to this Matter, the Difference may ſeem very inconſiderable.

Table I. Of the Rain which fell at *Upminſter*, from the Year 1697, to the Year 1714.

Year	Weight.		Depth.	
	l.	Cent.	Inch.	Cent.
1697	77	60	15	52
1698	122	32	24	46
1699	75	54	15	11
1700	95	13	19	03
1701	93	45	18	69
1702	101	89	20	38
1703	119	94	23	99
1704	79	02	15	81
1705	84	62	16	93
1706	121	43	24	29
1707	81	55	16	31
1708	96	09	19	22
1709	132	82	26	56
1710	91	84	18	37
1711	118	02	23	60
1712	118	78	23	76
1713	115	80	23	16
1714	55	95	11	19

TABLE II.

	French.		*Engliſh*	
Anno.	Inch.	Lin.	In.	Cnt.
1689	18	11½	20	23
1690	23	3¾	24	87
1691	14	5¼	15	40
1692	22	7½	24	14
1693	22	8	24	18
1694	19	9	21	07
1695	19	7¾	20	96
1696	19	5½	20	76
1697	20	3	21	60
1698	21	9	23	20
1699	18	8¼	19	93
1700	20	0½	21	38
1701	21	4¼	22	78
1702	16	4	17	42
1703	17	4¼	18	51
1704	19	10½	21	20
1705	13	10¾	14	82
1706	15	3⅝	16	32
1707	17	11	19	11
1708	18	3½	19	51
1709	21	9⅛	23	21
1710	15	8¾	17	10
1711	25	2	26	84

Of the great Storm Nov. 26-27. 1703. *by Mr.* Derham, *n.* 289. *p.* 1530.

XIII. I do not think it improper to reflect as far back as *April*, *May*, *June*, and *July*; becauſe all theſe were wet Months in our Southern Parts. In *April* there fell 12,49 *l.* of Rain thro' my Tunnel. And about 6, 7, 8 or 9 *l.* I eſteem a moderate quantity for *Upminſter*. *In* May *there fell more than in any Month of any Year ſince the Year* 1696, viz. 20,77 *l.* *June* likewiſe was a dripping Month, in which fell 14,55 *l.* And *July*, altho' it had conſiderable Intermiſſions, yet had 14,19 *l.* Above 11 *l.* of which fell on *July* 28th and 29th in violent Showers. And the News Papers gave accounts of great Rains that Month from divers places of *Europe*, but the *North of England* (which alſo eſcaped the violence of the late Storm) was not ſo remarkably wet in any of thoſe Months; at leaſt not in that great Proportion more than we, as uſually they are, as I gueſs from Mr. *Towneley*'s Tables of Rain. Particularly *July* was a dry Month with them, there being no more than 3,65 *l.* of Rain fell through Mr. *Towneley*'s Tunnel of the ſame diameter with mine. *September* we ſhall find to have been a wet Month, eſpecially the latter part of it ; there fell of Rain in that Month 14,86 *l.* *October* and *November* laſt, although not remarkably wet, yet have been open warm Months for the moſt part. My Thermometer (whoſe freezing point is about 84) hath been very ſeldom below 100 all this Winter, and eſpecially in *November*. This preceeding Diſpoſition of the Year, particularly as to wet and warmth, I am of Opinion had a great influence in the late Storm ; not only in cauſing a Repletion of Vapours in the Atmoſphere, but alſo in raiſing ſuch Nitro-ſulphureous or other heterogeneous Matter, which when mix'd together, might make a ſort of Exploſion (like fired Gunpowder) in the Atmoſphere. And from this Exploſion I judge thoſe Coruſcations or Flaſhes in the Storm to have proceeded, which moſt People as well as myſelf obſerved, and which ſome took for Lightning.

The foregoing Day, *viz. Thurſday, November* 25. I think deſerveth regard. In the Morning of that Day was a little Rain, the Winds high in the Afternoon S by E, and S : In the Evening there was Lightning, and between 9 and 10 of the Clock at Night a violent but a ſhort Storm of Wind and much Rain at *Upminſter*, and Hail in ſome other Places, which did ſome Damage. There fell in that Storm 1,65 *l.* of Rain. The next Morning, which was *Friday, November* 26. the Wind was S S W. and high all Day, and ſo continued till I was in Bed aſleep. About 12 that Night the Storm awaken'd me, which gradually encreas'd till near 3 that Morning. And from thence till near 7, it continued in the greateſt Exceſs ; and then began ſlowly to abate, and the *Mercury* to riſe ſwiftly. The Barometer I found at 12 h. $\frac{1}{2}$ P. M. at 28,72, where it continued till about 6 the next Morning, or 6 and a quarter, and then haſtily roſe ; ſo that it was gotten to 82 about Eight of Clock. How the Wind ſate during the late Storm I cannot poſitively ſay, it being exceſſively dark all the while, and my Vane blown down alſo. But by Information from Millers, and others that were forc'd to venture abroad, and my own Gueſs, I imagin it to have blown about S. W. by S. or nearer to the S. in the beginning, and to veer about towards the Weſt towards the end of the Storm, as far as W. S. W. The degrees of the Wind's ſtrength being not meaſurable (that I know of, tho' talk'd of) but by Gueſs, I thus determine, with reſpect to other Storms. On *Feb.* 7. 169$\frac{8}{9}$, was a terrible Storm that did much Damage. This I number 10 Degrees ; the Wind then † W. N. W. Another remarkable Storm was on *February* 3. 170$\frac{1}{2}$, at which time was the greateſt deſcent of *Mercury* ever known. This I number 9 Degrees. But this laſt of *November*, I number at leaſt 15 Degrees.

As to *November* 17th (whereon Mr. *Towneley* mentions a violent Storm in *Oxfordſhire*) it was a Stormy Afternoon here at *Upminſter*, accompany'd with Rain, but not violent, nor *Mercury* very low. *November* the 11th and 12th had both higher Winds and more Rain ; and the *Mercury* was thoſe Days lower than even in the laſt Storm of *November* 26. I have accounts of the Violence of the Storm at *Norwich*, *Beccles*, *Sudbury* *Colcheſter*, *Rochford*, and ſeveral other intermediate Places ; eſpecially from

† *Phil. Tranſ. n.* 262. *Abr. Vol.* II. *p.* 91.

from a Clergy-man at *Lewes* in *Suſſex*, of an odd Phænomenon occaſioned by it, *viz.* "That a Phyſician travelling ſoon after the Storm to *Tiſehyrſt*, about 20 Miles from *Lewes*, and as far from the Sea, as he rode "he pluckt ſome tops of Hedges, and chewing them found them Salt. "Some Ladies of *Lewes* hearing this, taſted ſome Grapes that were ſtill "on the Vines, and they alſo had the ſame reliſh. The Graſs on the "Downs in his Pariſh was ſo ſalt, that the Sheep in the Morning would "not feed till Hunger compelled them, and afterwards drank like Fiſhes, "as the Shepherds report. This he attributeth to Saline Particles "driven from the Sea. —— He heareth alſo, that People about *Portſmouth* were much annoyed with ſulphurous Fumes, complaining they "were almoſt ſuffocated therewith".

A Table, ſhewing the Height of the *Mercury* in the Barometer, at *Townley* and *Upminſter*, before, in, and after the Storm.

Townley.

Day.	Hour.	Height of *Mer.*
Nov.	7	28 98
25	3	64
	9½	61
	7	80
26	3	70
	9½	47
	7	50
27	3	81
	9½	95
	7	29 34
28	3	62
	9	84
29	7	88

Upminſter.

Day.	Hour.	Height of *Mer.*
Novr.	8	29 50
25	12	39
	9	14
	8	33
	12	28
26	9	10
	12½	28 72
	7½	82
27	12	29 31
	9	42
	8	65
28	12	83
	9	30 07
29	8	25

A ſtrange Effect of it in Suſſex, *by* J. Fuller, *Eſq; ib. p.* 1530.

2. We live ten Miles off the Sea in a direct Line, yet can ſcarce perſuade the Country People, but the Sea Water was blown thus far, or that during the Tempeſt, the Rain was ſalt, for all the Twigs of the Trees the day after were white, and taſted very ſalt, as I am inform'd, tho' I taſted them not time enough my ſelf, nor obſerv'd it; and that not only upon this Hill where we live facing the Sea, but in all other places within 14 or 15 Miles of the Sea, as well in the Vallies, between which and the Sea are very high Hills, as on the Hills themſelves.

Upon

Obſervations on the ſame by Mr. Lewenhoeck, *ib. p.* 1535.

3. Upon the 8th of *December*, 1703. N.S. We had a dreadful Storm from the South Weſt, inſomuch, that the Water mingled with ſmall parts of Chalk and Stone, was ſo daſh'd againſt the Glaſs Windows, that many of them were darkned therewith, and the lower Windows of my Houſe, which are made of very fine Glaſs, and always kept well ſcower'd, and were not open'd till 8 a Clock that Morning, (notwithſtanding that they look to the North Eaſt, and conſequently ſtood from the Wind; and moreover, were guarded from the Rain by a kind of Shelf or Pent-houſe over them;) were yet ſo covered with the Particles of the Water which the Whirl-wind caſt againſt them, that in leſs than half an Hour they were deprived of moſt of their tranſparency; and, foraſmuch as theſe Particles of Water were not quite exhaled, I concluded that it muſt be Sea-water, which the ſaid Storm had not only daſh'd againſt our Windows, but ſpread alſo over the whole Country. That I might be ſatisfied herein, I blow'd two ſmall Glaſſes, ſuch as I thought moſt proper to make my Obſervations with, concerning the Particles of Water that adhered to my Windows. Preſſing theſe Glaſſes gently againſt my Windows, that were covered with the ſuppos'd Particles of Sea water, my Glaſſes were tinged with a few of the ſaid Particles.

Theſe Glaſſes, with the Water I had thus collected on them, I placed about half a Foot diſtance from the Candle. I view'd them by my Microſcope, reckoning, that by the warmth of the Candle and my Face together, the Particles of the ſaid Water would be put into ſuch a Motion, that they would exhale for the moſt part, and the Salts that were in 'em would be expos'd naked to the Sight, and ſo it happen'd; for in a little time a great many Salt Particles did, as it were, come out of the Water, having the Figure of our common Salt, but very ſmall, becauſe the Water was little, from whence thoſe ſmall Particles proceeded; and where the Water had lain very thin upon the Glaſs, there were indeed a great number of Salt Particles, but ſo exceeding fine, that they almoſt eſcaped the Sight through a very good Microſcope. From whence I concluded, that theſe Glaſs windows could not be brought to their former Luſtre, but by waſhing them with a great deal of Water; for if the Air were very clear, and the Weather dry, the watry Particles would ſoon exhale, but the Salts would cleave faſt to the Glaſs, which ſaid Salts would be again diſſolv'd in moiſt Weather, and ſit like a Dew or Miſt upon the Windows. And accordingly my People found it when they came to waſh the afore-mentioned lower Windows of my Houſe; but as to the upper Windows where the Rain had beat againſt them, there was little or no Salt to be found ſticking upon that Glaſs.

Now if we conſider what a quantity of Sea-water is ſpread all over the Country by ſuch a terrible Storm, and conſequently how greatly impregnated the Air is with the ſame; we ought not to wonder, that ſuch a quantity of Water, being moved with ſo great a force, ſhould do ſo much Miſchief to Chimneys, tops of Houſes, *&c.* not to mention the Damages at Sea. During the Storm, and about 8 in the Morning, I caſt my Eye on the Barometer and obſerv'd that I had never ſeen the Quickſilver ſo low; but half an Hour after, the Quickſilver began to riſe; tho' the Storm was not at all abated, at leaſt to any Appearance; whence I concluded the Storm would not laſt long, and ſo it happened.

The Hiſtory of the great Froſt in 1708. *by* **Mr.** Derham, *n.* 324. *p.* 454. † *V. ſupr. Tract.* 5.

XIV. As to the Degree of this Froſt in *England*, I believe it was greater (if not more univerſal alſo) than any other within the Memory of Man. The greateſt that happened within our Memory, was the *Long Froſt* in 1683; but the late Froſt, although of ſhorter continuance, was more intenſe than that; of which I have already given ſome account in a former † Paper, *viz.* That my Thermometer was much lower on *December* 30. than it had ever been ſince 1697. when I firſt began my Thermometrical Obſervations; That the ſelf-ſame Thermometer in our Repoſitory in *Greſham*-College was lower than ever it was before: [The Particulars of its greateſt Deſcents are theſe; *January* 26. 1696. 41 *Gr. January* 5. 1683. 40 *Gr.* and *January* 3. 170$\frac{8}{9}$ 43 *Gr.*] And laſtly, that in another ſelf-ſame Glaſs in **London** [Mr. *J. Patrick*'s] the Spirits were four or five degrees lower than in 1683. In *London* the greateſt Contraction of the Spirits was on *January* 3. which was an exceſſive cold Day at *Upminſter* alſo: But the far greateſt Contraction with us was on *December* 30. before. The Reaſon of the Difference is, becauſe my Thermometer is always abroad in the open Air, where no Sun-ſhine toucheth; but thoſe two *London Glaſſes* are within Doors, in Rooms where no Fires are made. And it is eaſy to obſerve, that the Froſt doth not preſently exert its greateſt force within Doors: and when it doth, neither doth it ſo ſoon abate its force within Doors, as without. Theſe Obſervations of the Intenſeneſs of the Cold with us, I have received Confirmations of from other Places in the Southern Parts of our Iſland; particularly I find them to agree with ſome Obſervations made at *Streatham* in *Surrey* by Mr. *Creſſener*.

The Deſcent of the Spirits in my Thermometer on *December* 30. was within one tenth of an Inch as great as the Deſcent effected at another time (and that in a cold Day too) with artificial Freezings perform'd both with Snow and Salt, and alſo Snow and Spirits. Both which Mixtures I have ſeveral times made uſe of, and find them nearly of equal Power: If any difference be, I have ſometimes thought the Preference due to the Mixture of Spirit of Wine with the Snow. I ſaid alſo the Contraction of the Spirits in a cold Day, becauſe an artificial Freezing is leſs vigorous in a warm Day than in a cold one. It is well known that we can in Summer freeze with Ice and Salt, and the ſame may be then done with *Sal Armoniack* diſſolv'd in Water; but we cannot produce ſo intenſe a Froſt then by theſe means, as in Winter, and eſpecially in a very cold Day.

The Degree of the Froſt in Scotland *and* Ireland.

But notwithſtanding the Froſt was ſo extreamly rigorous in the Southern part of our Iſle, yet the Northern felt little thereof. My Learned Friend Dr. *Sloane* writes to me in general, That he hath receiv'd many Informations from thoſe Parts, which do all agree that the Winter was no way extreamly cold there, but as other Winters. The Lord Biſhop of *Carliſle*, writes thus from *Roſe*, *November* 5. 1709. “In *January* laſt I had a ſufficient Occaſion to take notice of the Froſt and Colds being more intenſe in the Southern Parts than here, and the Snow much thicker. I began my *London*-Journey on the 26th of that Month, three Days before the Thaw, and can aſſure you that for ſeveral Miles (near the Banks of the River *Eden*, in both the Counties of *Cumberland* and *Weſtmorland*) my Horſes hardly ever trod upon Snow. When we came to *Stanemoor*, on the Confines of *Yorkſhire*, we found the Ground covered pretty thick, and the deeper ſtill the farther we came to the South. None of our Rivers or Lakes were frozen over; and the extraordinary Flocks of Swans that reſorted hither (nothing of the like having been ſeen by the eldeſt Man living) was a ſure Argument that the Temperature of Climates was ſtrangely inverted.

Sir *Robert Sibbald*, in a Letter from *Edinburgh* of the ſame Date, ſaith, “I can learn no extraordinary Effects of the cold Seaſon here. It was a long Winter, the Cold came early in *October*, and continu'd till near *May*. There was much Snow, which lay long upon our Hills near this Place. We had not much Froſt to ſpeak of, and it laſted not long. There was but little Sport at *Curling* upon the Ice”. [a Sport in *Scotland*, uſual in hard Froſts, when the Ice can bear a great Company of People.]

Alſo in *Ireland* the Froſt was very favourable: of which, among other Things, I hear from Mr. *Sam. Molyneux*, at *Dublin*, that, “They had there an harder Winter than uſual, but judgeth they ſuffered not ſo much as their Neighbours: They had two or three pretty hard Froſts, and ſome Snow, but not of any remarkable Continuance, as he remembers.”

In other Parts of Europe.

Let us next look farther abroad, and firſt into the more *Southerly Parts of* Europe.

† *V. ſupr. Tract.* V.

In the Compariſon I have already given between † Dr. *Scheuchzer*'s Obſervations at *Zurich* and mine here, I ſaid, That he noted the Cold to have been exceſſive there; but whether more than uſual, he ſaith not. But by a Letter I have lately ſeen from his Brother, it appears to have been in as great and unuſual Exceſs there, as it was with us. In that Paper alſo I have ſaid to what Exceſs the Froſt arrived in *Italy*, *viz.* “That the Cold there was ſo great, that for 20 Years paſt they had not been ſenſible of greater, and on *Twelfth-Day* it wanted but half a Degree of the Extremity.”

Froſt

As to the *Northern Parts*, Dr. *Woodward* tells me, That in a Letter he received from Mr. *Otho Sperling*, from *Copenhagen*, dated *April* 5. 1709, he calleth it *Hyems Atrociſſima.* And I find it noted in the Minutes of the *Royal Society* of *May* 4. 1709. ‘ That Dr. *Judichar* ſaid the Ice was ‘ frozen in the Harbour of *Copenhagen* 27 Inches; and that *April* 9. *N.S.* People had gone over between *Schonen* and *Denmark* on the Ice. In the Northern Parts of *Germany* alſo I find they had the ſame Fare: of which I had a printed Account put into my Hands by Dr. *Woodward.* The Title is, *Conſideratio Phyſico-Mathematica Hyemis proxime præterlapſæ*, &c. being an Academical Exerciſe performed in the Univerſity of *Hall*, *June* 13. 1709 by *G. Remus* a *Dantzicker*, and Printed at the ſame place [*Halæ Magdeburgicæ.*] A ſhort account whereof may not be unacceptable.

The ingenious Author diſtributes the Winter into five Periods. The firſt of which he begins at *October* 19. 1708. at which time he ſaith the cold Weather began with them, the Northerly Winds then blowing, and froſty Weather accompanying it. But with us at *Upminſter*, it began ſomething ſooner: For all the latter end of *September* the Winds were Northerly, and an Hoar-Froſt on *Michaelmas*, and the following Days. After which, a great part of *October* to the 23d Day, my Regiſter ſhews the Weather to have been for the moſt part Hoar froſty, or Froſty, very agreeably to Mr. *Remus*'s Obſervations. The end of this firſt Period he placeth on *November* 3. the ſame with our *October* 23. *O.S.*

As to his next Period, which with its Interval takes in *November* and *December*, I find a pretty deal of Agreement between his Obſervations and mine, the Weather often being warm, or cold here, as it was there, and the Winds alſo not very different. Only I obſerve the Cold in one place commonly to precede the other. Alſo the furious Wind, that he ſaith blew the night before *December* 13. was not perceivable here 'till the ſecond Day after, *viz.* *December* $\left\{\begin{matrix}14\ N.\ S.\\ 3\ O.\ S.\end{matrix}\right.$ about Noon: At which time it had much ſpent it ſelf, and was only a brisk Eaſterly Wind, but no Storm. The third Period he begins on *January* 5. of which he ſaith, “ Scena ſubito mutabatur, & cum univerſæ Europæ admiratione cœpit “ Periodus, inſolito prorſus frigore notabilis. The very ſame $\left.\begin{matrix}Jan.\ 5.\\ Dec.\ 25.\end{matrix}\right\}$ the Wind and Weather began here to change, as there he ſaith it did, and the Cold alſo to encreaſe. The moſt remarkable Depreſſions of the Spirits he hath put into a Table, which may be ſeen with mine in this following little Table, fitted to our old Stile.

Day of the Month, O. S.		Degree of the Thermometer at Hall, at 10h. p. m.	Degree of the Thermometer at Upminſter, at 9h. p. m.
Dec.	27	84½	65
	28	84½	75
	29	92½	58
	30	100	45
	31	Totus intra Sphæram.	52
Jan.	1		63
	2		54

For the right Underſtanding theſe Obſervations, it is to be obſerved that the Scale of their Thermometer runs downwards from ſome Point above, down towards the Ball. But the Ball, or bottom of the Stalk, being a certain Place that all Thermometers agree in, and every one is acquainted with, I therefore make the Degrees of the Scale of my Thermometers to begin at the top of the Ball, or (which is all one) at the bottom of the little Tube or Stalk; and ſo reckon upwards; every Degree being one tenth of an *Engliſh* Inch; the *Freezing Point* in my old Thermometer (here noted) at 82 gr. equal to 8 Inches, two Tenths from the Ball; and the more *Intenſe Cold* at 44 gr. But in my later Thermometers (which I now uſe, and are much nicer than my old one) the *Freezing point* is at 100 gr. ten *Engliſh* Inches from the Ball, and the moſt *Intenſe Froſt* near to, or juſt in the Ball.

He makes the third Period to end *January* $\left\{\begin{matrix}25 \text{ N. S.}\\ 14 \text{ O. S.}\end{matrix}\right\}$ with a weſterly Wind, and a Thaw, which held for a few Days. With us the Wind was Southerly at the ſame time, and a Thaw accompanying it for a few Days likewiſe.

The fourth Period he begins *January*, $\left\{\begin{matrix}31 \text{ N. S.}\\ 20 \text{ O. S.}\end{matrix}\right\}$ In which I obſerve there is a great Agreement between our Obſervations as to the Cold; and thoſe Days on which he noteth the weſterly Winds to have been ſtrong, it was the ſame here. And ſome Agreement alſo, but leſs, is in the Coaſting and Shifting of the Winds throughout this Period.

The fifth and laſt Period he placeth between *Feb.* $\left\{\begin{matrix}17\\ 6\end{matrix}\right.$ and *March* $\left\{\begin{matrix}17\\ 6\end{matrix}\right.$ In this Period he ſaith, the cold Weather returned, and continued long: And the ſame it did with us. But as to the end of this Period, I find ſome Difference, and ſome Agreement between our Obſervations. The Snow was more with them than us; the Winds changed with us from the Eaſterly Points, to the Weſterly and Southerly, a Day or two ſooner than with them; then agreed with them; and ſoon after veered about to the Eaſterly and Northerly as it did with them. And I obſerve farther alſo, that when the Winds agreed in both Places, my Notes ſhew the Wind to have been of ſome force here.

As to the warmth of the Weather all this time, I find a pretty deal of Agreement; only as the Wind changed two Days ſooner here, ſo we had the mild Weather he mentions two Days ſooner: Then it grew colder here, as he ſaith it did with them. And whereas he noteth *April* $\left\{\begin{array}{l}13\ N\,S.\\ 2\ O.\,S.\end{array}\right.$ to have been the firſt Day on which the Spirits roſe to the Point of Warmth, I found by my Thermometer (then renewed) the Day before to have been as warm as that, as alſo were the following Days; and each of them warmer than had been all the preceeding Winter; but yet that we had divers warm Days before that time, particularly *March* 12, 13, 14, 18, 19, 28. *O. S.* were warm Days, but the reſt in that Month for the moſt part Cold.

I ſhall next ſhew what unuſual *Effects* this Froſt produced; and that on *Fluids*, *Animals*, and *Vegetables*.

The Effects of the Froſt on Fluids.

The Waters we may eaſily imagine were the firſt thing that felt the dire Effects of this Froſt. And theſe were in many Places frozen to an extraordinary depth; although I hardly believe to that depth, as in the Long-Froſt in 1683. Of which Froſt we have a ſufficient inſtance in our River of *Thames*; whoſe Waters were ſo frozen, that above Bridge, 'tis well known, many Booths were erected, Fires made, and Meat dreſs'd; and on *January* 10. $168\frac{3}{4}$. I my ſelf ſaw a Coach and two Horſes drive over the River into *Southwark*, and back again, a great number of People accompanying it. But this laſt Winter the Caſe was greatly different, according to this Account I received from Mr. *Lowthorp*; who ſaith, ‘He ſaw ſeveral People croſs the *Thames* at ſome diſtance above the Bridge: But that was only towards Low-water, when the great Flakes of Ice that came down, ſtopp'd one another at the Bridge, 'till they made one continued Bed of Ice from thence almoſt to the *Temple*. But when the Flood came, the Ice broke, and was all carried with the Current up the River. I was told the like happened between *Weſtminſter* and *Lambeth*, a little above *White-hall*’. As for other Waters, they alſo had their ſhare; eſpecially where they lay expoſed to the Northerly and North Eaſterly Winds. Nay, the Sea-waters themſelves eſcaped not, but were covered with Ice in many Places near the Shore, in Harbours, and where they lay calm and ſtill. Of this I have already given a pregnant Inſtance in the Harbour of *Copenhagen*, and the Sea between *Denmark* and *Schonen*. And in a Letter from Dr. *Newton*, Her Majeſty's Envoy at *Florence*, he tells me, “The Sea was frozen both on the Coaſt of *Genoa* and *Leghorne*”.

Froſt

As for the Northern Parts of *Germany*, the laſt cited Diſſertation gives this Account of its Effects on Fluids: *Aqua infra ſolitam profunditatem in glaciem abiit, & alii liquores congelati apparuere, qui alias extra congelationis periculum media hyeme conſtituuntur. Pertinet huc Fons in quodam Sileſiæ pago, qui cum alias æſtate frigidus, hyeme calidus deprehendatur, hac tamen hyeme ſpiſſa ſatis glacie non ſine omnium admiratione obductus fuit. Certe Novellæ publicæ aliquoties Thermas in glaciem converſas nunciarunt: Id quod tamen calidioribus non accidit* - - - - - Halæ *ſtrias fontibus ſalſis adhærentes vidimus, id quod intra ſeculi ambitum non contigiſſe fertur. Per literas me certiorem reddidit* D. Breynius, *in urbe patria Medicus celeberrimus, Soc. Reg. Ang. Soc. &c. ipſum mare, quouſque oculorum acies etiam armata penetrare poterat, adhuc die* 8. *Aprilis glacie tectum fuiſſe. Cum is Lixivium cineribus clavellatis ad ſaturitatem ferme imprægnatum aeri expoſuiſſet, licet nunquam congelare ab hominibus, qui pluribus annis id tractaverant, aſſereretur, brevi tamen tempore in glaciem converſum eſſe expertus. Addit, amicum quendam ſuum Tartari quoque ſpiritum dephlegmatum congelatum obſervaſſe. Referunt obſervationes* Halenſes *Sputum ex ore vix dimiſſum in glaciem abiens* - - - - *Fluvii ter in glaciem abiere, etiam illi, quibus ob celeritatem, qua feruntur, frigus alias non infeſtum.*

Theſe Effects I am apt to think the Waters felt not only in *England, Denmark, Germany, France* and *Italy*; but in all the *Northern World* alſo, excepting *Scotland, Ireland*, and probably ſome other Iſlands, or Places near the Sea; although even ſome of theſe appear from the foregoing Account to have been great Sufferers too. This Univerſality of the Froſt I ſuſpect from the Multitudes of divers kinds of Birds (utter Strangers to theſe Parts, and many of them Inhabitants of the Northern colder Countries) which were ſeen and killed in many Parts of *England*. In our *Eſſex-Marſhes* near us, we had many wild Swans, Brent-Geeſe, many of the rarer Gull-kind, and divers other ſorts of Birds, utter Strangers to theſe Parts. And Mr. *Bellers* gave Dr. *Woodward* a Catalogue of 20 Species of Birds killed within four or five Miles of *Coln* St. *Aldwins*, or *Edwins*, in *Glouceſterſhire*, between the beginning of *November* and the latter end of *March* 1708, which he ſaith are never found there in moderate Winters.

On Animals.

In the Diſſertation before cited, we are told, how Animals ſuffered both with them, and in other Places; ‘That the freſh-water *Fiſh* were every where killed in their Parts, and that a vaſt Deſtruction befel their *ſmall Birds*. Both which things he was informed happened in his own Country alſo at *Dantzick*. Nay ſome did not, ſaith the Author, ſtick to affirm, that they ſaw Birds, as they flew along, to drop down out of the Air, their Strength failing: That the *Luſatia Letters* ſaid many Cows were frozen to Death in their Stalls. And many Travellers on the Road, he tells us, were ſome quite frozen to Death, others loſt their Hands, Feet, Noſes or Ears; and others fainted, and were in great danger of Life or Limb, when brought too ſoon near the Fire. Of theſe Particulars he gives divers Inſtances from

‘ their News Papers; of two Gentlemen, and a Smith in *England*, and ‘ above 60 Men, and many Cattle near *Paris*; and the like at *Venice*, and ‘ 80 *French* Soldiers near *Namur*, all killed on the Road with the Cold’. Our freſh-water Fiſh alſo were many of them deſtroy'd in Ponds that were ſhallow, and eſpecially if long frozen over; ſome for want of Air, where the Ponds were not kept open; and ſome with the cold Air at the Holes in the Ice, where in great numbers they came to get Breath. On the *Italian* Coaſt ſome of our poor ‘ Mariners on board our Men of War ‘ died of the Cold; and ſeveral loſt parts of their Fingers and Toes; As the before named Dr. *Newton* writes to me.

But the greateſt Sufferers in the Animal Kingdom were *Birds* and *Inſects*. *Robin Redbreaſts*, which before the Froſt were numerous, are ſince that very ſcarce about us, only here and there one to be ſeen. Nay, notwithſtanding their Recruits in the following Summer, yet even ſtill, in this ſucceeding Winter, their ſcarcity remains. *Larks* alſo, both *Wood* and *Sky-Larks*, became in a manner Rarities in our Country the following Spring and Summer. Neither are they as yet become ſo numerous as heretofore. And I have lately enquired of the *London*-Poulterers; who tell me, they have Larks from almoſt all Parts of *England*, and have not this following Year received a Quarter, nay, ſcarce a Tenth part of the Larks they uſed to have, by reaſon the Froſt killed them, as the Bird-catchers ſay. In the *Inſect-Tribe*, I have particularly obſerved the *Pediculus Pulſatorius*, or *Fatidicus*, or *Death Watch*, to be great Sufferers. For few of them appeared the following Summer; and in places where they uſed in *July* to be very ſonorous with their Ticking Noiſe, only now and then one was heard; a manifeſt ſign of their being either killed, or rendered leſs fertile and venereous.

On Vegetables. But among all the Sufferers by the Froſt, the *Vegetables* were the moſt univerſal; few of the tender Sorts eſcaping. About us, *Bays*, *Roſemary*, *Cypreſſes*, *Myrtles*, moſt of the *Phillyrea*'s, yea, even *Junipers*, among Shrubs; and *Artichokes*, *Colly-Flowers*, and a great many other Olitory Plants ſuffered greatly. In a word, I have been informed ſome of the *London* Gardners have loſt to the Value of 80 *l.* 100 *l.* yea 200 *l.* But the moſt exact Account which I have met with, is from Mr. *Bochart*, of the *Oxford* Phyſick-Garden, in a Letter to Mr. *John Thorpe*, F. R. S. in which he takes notice, That the Damages of this Froſt do not come up to thoſe in 1683; which Froſt being of longer continuance, cleft the *Oaks*, and Bodies of the *Vines*, &c. But in the laſt Froſt there were Intervals of Relaxation, beſides ſeveral conſiderable Snows, which proved a good Guard to many Plants. But the Snow melting, and the Cold withal continuing, proved of evil Conſequence to many Bulbous and Tuberous Roots, and abundance of other things. ‘ But (he ſaith) the ſharp, dry, and cutting Winds ‘ from the North, and North-Eaſt, were moſt Deſtructive to many of the ‘ Ornaments of our Gardens, which before ſeem'd ſo good natured, as to ‘ be almoſt naturaliz'd to our Clime; as *Cypreſs*, *Bays*, *Roſemary*, *Alaterni*, *Phillyrea*'s, *Arbuti*, *Lauruſtines*, &c. as alſo to moſt of our Fruteſcent Herbs, ſuch as *Lavenders*, *Abrotonums*, *Rue*, *Thyme*, and divers others of ſuch Race, eſpecially ſuch as had their Heads above the kind covering of the Snow: And not ſuch Exoticks only, but ſome of our own Natives, as is viſible in moſt of our *Furze-fields*, and divers *Hollies*, eſpecially of the finer ſtrip'd Race, have felt the ſmart of ſuch the Vigour of the Seaſon, by the loſs of their Leaves, beautiful enough, and ſometimes their Lives. And what (he ſaith) hath been more obſervable this Year, than in others is, The Sap of our finer mural Fruit-Trees, as of *Peaches*, *Nectarines*, *Apricocks*, &c. was ſo congealed and diſordered, that it proved ſtagnated in the Limbs and Branches, and equal to Chillblains in humane Bodies; which in too many Parts of the Tree, turned to ſo frequent Mortifications, that it is very much to be doubted whether ſufficient Vigour is ever to be expected from them, to be worth their ſtanding, notwithſtanding their weak Endeavours of ſhooting, and recovering of ſuch their Maladies, ſeeming to make work for another Winter to compleat, what this hath ſo unhappily begun. And it is no leſs obſervable than extraordinary, That the very Buds in theſe finer Trees, as well Leaf-Buds, as Bloſſom-Buds (which are but the Ovaries of the ſucceeding Fruits) were quite killed, and dry'd into a farinaceous Matter, by the too great Sharpneſs of the Cold, before they grew out, though Life remained in the Branch. The *Plumbs* being more hardy, produced their Bloſſoms well enough; but through the chilling Wets before mentioned, which happened too plentiful about that time, and the great Defect of nutritive Warmth, they grew weak; with their little Stalks, or Pedicles languiſhing, and turning yellow, generally dropt off, and came to nothing. It might (he ſaith) reaſonably have been ſuppoſed, that ſuch conjoyn'd Cold, with repeated Wets, ſhould have deſtroy'd the injurious *Inſects*, which uſually infeſt the firſt Product; but even this Year, they have proved vivid, in too great plenty among the *Apples* and *Pears* (eſpecially the former) whoſe Bloſſoms, as well as Leaves, have been too copious pabulum for theſe voracious *Erucas*, whoſe Eggs lay dormant all the Winter, ſo dry in their Bags, that there were ſo many eſcaped from being frozen, that in many Places they proved enough to deſtroy the whole Verdure. *Fig-Trees* (he tells us) whoſe ſofter Texture was more eaſily penetrated, have ſuffered much, moſt of them being cut down, to begin the World again. Many *Exotick Greens*, and rare Plants coming from *Africa* and other warm Regions, have mightily ſuffered, eſpecially in ſuch Stoves and Conſervatories as were too parſimoniouſly defended by Fire.

What he obſerveth concerning the Deſtruction of *Wheat*, was I believe a general Calamity in other places. ‘Where the Land was poor, and coldly expoſed, there the *Wheat* was kill'd; that many Lands of Wheat eſcaped tolerably well on the ſame warm ſide, when the other ſide was quite killed with the Extremity of the Cold’. By the *warm* *and cold Sides*, I ſuppoſe are meant the ſunny and ſhady Sides. But with us the Wheat ſuffered rather more on the Southern, ſunny Side, than the Northern; I ſuppoſe by reaſon the Ground was ſomewhat opened by the Sunſhine, and the covering of Snow melted, and way thereby made to the Severity of the Nocturnal Froſt. Upon which account I have heard it ſaid by ſome skilful Obſervers, *That Vegetables ſuffered more the laſt Winter from the Sun than the Froſt*. In *Eſſex* alſo about us, I obſerved many ſmall Fields of three or four Acres of Wheat to eſcape pretty well, where fenced with thick high Hedges againſt the cold Winds, eſpecially where they were covered long with Snow; at leaſt they came off better than other Parcels of Land expoſed to the Winds that diſlodg'd the Snow, and aggravated the Cold alſo. So in the Pariſh where I live, the beſt pieces of Wheat were ſuch I obſerved, as lay on gentle Deſcents facing the Weſt or S. W. eſpecially when guarded on the Eaſtern or N. Eaſtern ſide with a Hill or a Wood; which fenced off the cold piercing Eaſterly and North Eaſterly Winds.

And not only *Shrubs* and *Plants*, but the *larger Trees* have in ſome Places had their ſhare of ſuffering too. But it was obſerved at one of the Meetings of our Society, That the Calamities which befell Trees, aroſe not purely from their being frozen, but principally from the Winds ſhaking and rocking them at the ſame time, which rent and parted their Fibres. The *Northerly* parts of the Iſland eſcaped better; as will appear by another part of the foremention'd Letter of Sir *Rob. Sibbald*: 'The Corn did not riſe and ripen ſo ſoon as wont; but bleſſed 'be God, there hath been a plentiful Harveſt, well brought into the 'Barns and Yards. And the Price of Victuals (which was high) falls 'lower daily. There was no greater number of thoſe who died, than was 'uſual during the Winter formerly'.

I find the Effects were, in the more Southerly Parts of *Europe*, much the ſame on their Vegetables as in ours. In *Italy* Dr. *Newton* ſaith, 'Almoſt all the *Lemon* and *Orange-Trees*, with thoſe of the like kind, 'are deſtroyed in this Country by the Froſt, and a great many *Olive-'Trees*. The Leaves of the *Bay-Trees* have the ſame Colour now, as 'all others have when they are falling in *October*'.

There are two other Diſaſters he tells me of, owing probably to the Froſt: One is a Diſaſter that happen'd at *Florence*, where 'on the 'ſide of a Hill were formerly many Buildings, which twice falling 'down, by the Earth giving way, a Wall was Erected in the time of 'the Great Duke's Grandfather, with an Inſcription on the Wall, 'which ſeparates the Ground from the next Street, that for the future 'no Perſon ſhould build there. After the great Froſt, this Wall hath 'fallen down too. The Hill is full of Stones, and they will have it, 'that as thoſe increaſe, the Ground is puſhed forward, and thereby 'thrown down. But I am apt to think, the Froſt might have a great Concern herein. The other Accident befel at *Piſa*, where he ſaith, 'That upon the melting of the Snows, and the great Rains which fell after the Froſt, although the *Arno* did not ſwell over the Banks at *Piſa*, yet the Water at ſome diſtance from the River, in a middle Row of Houſes, betwixt the River and the great Street on the North ſide, with great Violence broke out, and if it had not been immediately perceived, and the Breach ſtopp'd by the throwing in of a great quantity of Bricks and Timber, that part of the Town might have been in danger of being drowned, where the *Palace*, and the *Publick Schools*, or as they call it, the *Sapienza* ſtand.

Dr. *Mich. Angelo Tilli*, Botanick Profeſſor at *Piſa*, hath only told me, ‘ That the Froſt hath deſtroy'd a world of Trees both in City and Country about them’. In *Switzerland*, among the high *Alpine* Ridges, they felt dire Effects of the Froſt, but yet ſome Places were ſo happy as to eſcape. Of which Mr. *John Scheuchzer* ſays, ‘ Effectus triſtiſſimos, quos Hyeme præterita ſenſere Arbores noſtræ, etiam craſſiſſimæ, præſertim *Juglandes*, *Vites*, non prorſus ſenſere loca quædam præaltis verſus Septentrionem jugis munita. *Veſcnæ* ad Rivarium-Lacum ſalvæ manſere arbores & vites, ut Vindemia (apud nos nulla) ibi ſit copioſa; *Juglandes* fructibus oneratæ, uti quoque arbores reliquæ, ac ſi in diverſo ſuccreviſſent a vicinis locis Climate. *Galendæ*, montis altiſſimi in confiniis *Rhætorum* & *Sarunetum*, radicibus adjacet pagus *Vettis*. Hujus incolæ vix unquam mitiorem Hyemem habuiſſe teſtantur, dum interim incolæ Pagi proximi *Valentiæ*, ſupra Thermas Labarias ſiti, durante ſummo Frigore, aditu mutuo prorſus intercluſo, veriti fuere, ne *Vettienſes* omnes frigore perierunt. E contra Sylvæ Boreæ expoſitæ, & Arboribus etiam vivaciſſimis, Abietibus, Taxis, Laricibus conſitæ, quaſi aduſtæ rufum induere colorem, foliiſque nudatæ’. Laſtly, as to the Northerly Parts of *Germany*, the Caſe was there after the manner it was with us; which Mr. *Remus* is very curious and particular in, ‘ Arbores, *ſaith he*, & frutices ultra nivis ſuperficiem prominentes magno numero Frigus deſtruxit. Ceraſus, Malus, & Prunus riſere Hyemis minas. Multa ramorum ſegmenta menſe adhuc Martio Microſcopio ſuppoſuit D. Præſes [that is Dr. *Wolfius*, Author of the *Elem. Aeromet.* Printed at *Leipſick*] nec quicquam integritati & turgeſcentiæ fibrarum deeſſe deprehendit . . . . Flores copioſi in Ceraſo, rariores in Malo, &c. . . . . . Nuces Amygdalæ, Mali Perſicæ & Mali Armeniacæ nobiliores pariter ac ignobiliores, Roſarum frutices tantum non omnes interierunt, Pyri plurimum damni perpeſſæ. Vites ſub terra defoſſas & ſatis tectas a frigoris ſævitie immunes vidimus, at reliquas contra illud non ſufficienter munitas prorſus deſtructas & ipſi conſpeximus, & Novellæ &c. . . . . . . Commemoranda vero ſunt . . . . quæ D. Præſes annotavit. Cum ſtatim ab æquinoctio, nive liquefacta, & glacie reſoluta, aditus in Hortos pateret, Cortex, Lignum, & Medulla in iis arboribus, quibus Frigus infeſtum fuerat, e. g. in Pyro & Malo Armeniaca, nigricabant. Unde multi . . . . . . extirpabant. Cum ſegmenta ramorum, qui præterita æſtate adoleverant, microſcopiis ſubjicerentur, fibrillæ hinc inde ‘diſruptæ, non ſecus ac in ligno putrido, conſpiciebantur: In reliqua autem ramorum parte nulla iſtiuſmodi diſruptio notari poterat, ſuccus unice deſiderabatur & viriditas. Enimvero cum circa medium Aprilis arbores calore Solis foverentur, in Malis Armeniacis ex ligno ſeniore paſſim novæ Gemmæ erumpebant, in quibuſdam etiam ex juniore ibi proveniebant, ubi flores progerminare debuerant; in nonnullis nullus ſurculus protruſus. Pyri Gemmæ omnes evolutæ, & Flores prodiere; conſueto tamen vigore plerumque deſtituti, atque hinc nulla Fructuum rudimenta relinquentes. Tunc temporis viriditatem plenariam conſequebatur Cortex, nigrior ex centro Medullæ verſus peripheriam migrabat, Ligni ſubſtantia candorem recuperabat, Fibrillæ novi anni adhuc nigricabant, per Microſcopium tamen conſpectæ non minus ac fibrillæ eædem in Ceraſo & Malo, quas frigus intactas reliquerat, ſucco turgeſcere videbantur. Equidem medulla ſub Gemmis inſolita nigredine paſſim tingebatur; radicula tamen Gemmæ in ſurculum protruſæ admodum turgida & virens oculo armato ſiſtebatur . . . . . Notabile vero, quod, quemadmodum Frigus Pruno, ita etiam gemmis Malorum Armeniacarum intra corticem ſurculorum Pruni immiſſis pepercerit, in proceras frondes nunc excreſcentibus juxta arbores ſui generis, quibus ne unicam Gemmam intactam reliquerat Frigus’.

Of the Cauſes of the great Froſt. The laſt commended Author having ingeniouſly enquired into the Cauſes of this Froſt, I ſhall as briefly as may be ſhew his Opinion. The Fountain of Heat enjoy'd by the Earth, being the Sun, and that Heat being not always the ſame, he enquireth into the reaſon why it is not ſo. The Variation of the mutual Diſtance between the Earth and the Sun at the Apogee and Perigee; the Mutation of the Earth's place in reſpect of the Heavens, or its being juſtled at a greater diſtance from the Sun, and the Obſtruction of the Solar Rays by the Spots on the Sun, he (after ingenious Enquiries and Calculations) rejects, and enumerates his Cauſes in theſe Words: *Ex hactenus dictis apparet, quænam ad Frigus hybernum producendum concurrere poſſint. Nimirum ex parte Solis requiritur ingens a vertice diſtantia, & exigua ſupra Horizonte mora: Ex parte Telluris vero, Atmoſphæra exhalationibus plena, & nubibus gravida; Ventique Orientales & Septentrionales, præſertim impetuoſi requiruntur. Omnium autem maxime neceſſarium, ut actiones Solis & diu, & tum imprimis impediantur, quando cauſæ Frigoris concurrunt.* Having thus aſſigned his Cauſes, he then applies them to his five Periods, and the more remarkable Accidents that happened in them.

But after all, notwithſtanding I like for the moſt part his Cauſes, as being thoſe which are the common and ordinary ones, yet there are ſome other more hidden extraordinary Cauſes, that he hath not reached. For we have all his Cauſes very commonly concurring in other Winters, without the ſame Effects as in the laſt. Yea this preſent, next ſucceeding Winter $17\frac{09}{10}$, we have had (beſides what is common to all Winters, the Obliquity of the Sun's Rays, *&c.* we have had I ſay) the

Winds as much Northerly and Eaſterly, and as ſtrong; and as much dark Weather; and all concurring together, as happen'd during the Great Froſt: And yet no more than ordinary ſevere Weather. But as to miſty, cloudy, dark Weather, which he reckons among his principal Cauſes, I am ſo far from thinking it a Cauſe, that I rather take it to be the reaſon we have not more frequent ſevere Froſts, at leaſt in our Iſland-places, ſurrounded by the warm Vapours of the Sea. Clouds and Vapours do indeed intercept, and keep off the Sun-beams; and probably imbibe and retain a great deal of Warmth themſelves; nay, perhaps they may (as he ſaith) reflect back ſome of the Sun-Rays, but we conſtantly in Winter find, that the fewer the Exhalations are, and the clearer the Air, after the Warmth of the Sun by Day, the ſharper the Froſt is at Night.

An Earthquake in the North of England, by Mr. Thoresby, *n.* 289. *p.* 1555.

XV. I received the following Account of an Earthquake from the Reverend Mr. *Banks* Vicar of *Hull*. '*December* 28. 1703. Mr. *Peers* my Reader, was then at his Study and writing, but the heaving up of his Chair and his Deſk, and the ſhake of his Chamber, and the rattling of his Windows, did ſo amaze him, that he was really affrighted, and was forc'd for a while to give over his Work. My Wife was then in her Cloſet, and thought her *China* would have come about her Ears, and my Family felt the Chairs moved, in which they were ſitting by the Kitchen Fireſide, and heard ſuch a rattle of the Pewter and Windows, as almoſt affrighted them. A Gentlewoman not far off ſaid, her Chair lifted ſo high, that ſhe thought the great Dog had got under it, and to ſave her ſelf from falling, ſlipt off her Chair. I ſent to a Houſe where part of a Chimney was ſhak'd down, to enquire of the Particulars; they kept Ale, and being pretty full of Company that were merry, they did not perceive the Shock, only heard the Pewter and Glaſs-windows dance; but the Landlady's Mother who was in a Chamber by her ſelf, felt the ſhock ſo violent, that ſhe verily believed the Houſe to be coming down (as a part of the Chimney afore-mentioned did at the ſame Moment) and cryed out in a Fright, and had fall'n but that ſhe catched hold of a Table. It came and went ſuddenly, and was attended with a Noiſe like the Wind, tho' there was then a perfect Calm'. It was felt in *Beverly* and other places, at *South Dalton* particularly, where the Parſon's Wife being alone in her Chamber, was ſadly frighted with the heaving up of her Chair ſhe ſate in, and the very ſenſible ſhake of the Room, eſpecially the Windows, *&c.* A Relation of mine near *Lincoln*, being then at a Gentleman's Houſe in the Neighbourhood, was amaz'd at the moving of the Chairs they ſat upon, which was ſo violent, he writes every Limb of him was ſhaken; I am told alſo from a ſure Hand, that at *Selby*, Mr. *Travers* a Miniſter, being in his Study writing, was interrupted much as Mr. *Peers* above-mentioned.

A Clergyman near *Lincoln* writes, That being about 5 in the Evening, *December* the 20th paſt, ſet with a neighbouring Miniſter at his Houſe about a Mile from *Navenby*, they were ſurpriz'd with a ſudden noiſe, as if it had been of two or three Coaches driven furiouſly down the Yard, whereupon the Servant was ſent to the Door, in Expectation of ſome Strangers; but they quickly perceived what it was by the ſhaking of the Chairs they ſat upon, they could perceive the very Stones move; he adds, that they were put into a greater Fright upon the Faſt-day, when there was ſo violent a Storm, they verily thought the Church would have fallen upon them. We had alſo at *Leedes* a much greater Storm the Night preceeding, and a ſtronger Wind that Day, than when the fatal Storm was in the *South*.

Earthquakes, &c. *in* New England, *by Dr.* Mather, *n.* 339. *p.* 69.

XVI. Tho' Earth-quakes, have not done in *New England* the Miſchiefs frequent in *Sicily*, *Italy*, &c. yet they have had ſeveral very ſenſible and affrightning. In the Year 1663. they had 6 or 7 violent ſhakes in the ſpace of 3 Days: a Town lying on the River *Connecticut*, has had Scores of them in a Year, for many Years together. The *Indians* affirm, That ſeveral Rivers have not only been ſtopt in their courſe and diverted, but ſome wholly ſwallowed up by Earth-quakes. There is farther a Paſſage out of *Joſſelin*, who dwelt in the Neighbourhood, that in the Year 1670, at a Place called *Kenebunch*, near the ſide of the River, a piece of clay Ground was thrown up over the tops of high Oaks, growing between it and the River, which it thereby ſtopt, and left a hole in the Place from which it was thrown forty Yards ſquare, *&c.* Next as to Storms of Hail, they have had there very extraordinary ones, inſomuch that they have lain three or four Foot thick on the Ground, ſome as big as Hens Eggs, others five times as big. I have obſerv'd an Accident ſometimes happening in the Winter, that it has rain'd plentifully, and at Night frozen ſo extremely, that the weight of the Icicles has broken the Limbs of the Trees, and not unfrequently ſplit their Trunks. Tho' they have not theſe *Hurricanes* to which the *Caribbe* Iſlands are ſubject; yet they have had Whirlwinds or Guſts, drive along a particular narrow Tract, for divers Miles together, with a Violence not to be oppoſed by any thing on Earth; that if their Towns had ſtood in the way, they muſt undoubtedly have been deſtroyed. Of theſe, a thick dark ſmall Cloud has aroſe, with a Pillar of Light in it, of about 8 or 10 Foot Diameter, and paſt along the Ground in a Track not wider than a Street, horribly tearing up Trees by the Roots, blowing them up in the Air like Feathers, and throwing up Stones of a great weight to a conſiderable height in the Air, throwing down all in its Paſſage; the Noiſe this Cloud made was ſo great all the while, that the Noiſe of the Miſchiefs done by it, was thereby quite drown'd.

Parhelia, &c. *ſeen in the Air by* Dr Halley. *n.*278.*p* 1127.

XVII. On the Eighth of *April*, this preſent Year, 1702, walking in *London* Streets about Ten in the Morning, the Air being clear, I obſerved the Sun to ſhine faintly, or as we call it wateriſh; whereupon caſting up my Eye, I perceived ſeveral Arches of Circles about him. I made what haſte I could to get on the top of a Houſe, by the Royal-*Exchange*, and found the Appearance as is deſcribed in Figure 1. *Plate* 2. wherein

S is the true Sun, *Z* the Zenith. *S T P P* a great white Circle paſſing through the Sun, and as near as I could judge, parallel to the Horizon. It was very diſtinct and entire, about two Degrees broad in the *Northern* part about *T*; and held much the ſame breadth in the *Eaſt* and *Weſt*, but grew narrower towards the Sun, its edges were not very well defined, the whole appearing like a faint white Cloud, and a part of it would have been taken for ſuch, but the whole Circle ſeen in the pure Azure Sky was a very ſurprizing Sight.

V N X T a *Halo*, or rather *Iris*, that was likewiſe an intire Circle, having the Sun for its Center. I meaſured the Semidiameter of this to be much about 22 Degrees: the breadth of this Arch, which was well defined, was by eſtimate equal to the Sun's Diameter, and it was coloured with the Colours of the *Iris*, but nothing near ſo *vivid* as in the common Rainbow. The *Reds* were next the Sun, and the *Blews* in the outward Limb. Within this Circle the Sky appeared ſomewhat obſcure, eſpecially near the Arch; and I take it, that the Cauſe of that Obſcurity was likewiſe the Cauſe that the Sun ſhone ſo faint and wateriſh. I expected two *Parhelia* at *X* and *T* in the Interſections of this with the white Circle, having often ſeen them at that Diſtance and Poſition from the true Sun, but at this time none ſuch appeared.

P U P. an Arch of another Circle, of which only the upper part appeared; it was in all Reſpects, both for Breadth and Colours like the Circle *V N X T* which it touched in the Vertical Point *V*, but its Center was below at *N*, or near it. In the Interſections of this Arch with the white Circle on both ſides were two very bright *Parhelia*, ſo luminous, that I do not remember to have ſeen the like, which were alſo tinged with Colours, eſpecially on the ſide next the Sun, where they were very red. I meaſured their Diſtance from the true Sun, and found it 31½ Degrees. About *V* where the two Arches were coincident, it was very bright likewiſe, and the *Red* on the inſide very ſtrong, that ſome might have imagined another Sun there alſo, but the *Species* thereof was drawn out ſo in length, that it could not properly be called a *Parhelion*: This Arch *P V P* broke off on both ſides, about five or ſix Degrees below the *Parhelia P. P.* At *N*, or the lower part of the Circle *U N X T*, there appeared likewiſe a ſmall piece of an Arch, which touched it there, after the ſame manner as *P U P* touched in *V*; it ſeemed to have its Center in *V*, and about *N* there appeared another longiſh red *Species*, ſuch as at *V*, but not altogether ſo bright. The height of the Sun, during the Obſervation, was from 40 to 45 Degrees, when Clouds interpoſing, no more was to be ſeen; the Weather was cooler than ordinary, with a gentle *NW* Wind. And it was plain that the Vapour, which cauſed this Appearance, was higher than the Clouds, for they were ſeen to drive under the Circles.

Parhelia, *or Mock Suns, by Dr.* Mather, *n.* 339 *p.* 66.

XVIII. *Jan.* 2. 1712. At *Boſton* in *New England* in a clear Sky but very cold, the Sun was, from 10 o'Clock for near 3 Hours after, attended with four *Parhelia*, in the midſt whereof were three Rainbows. About 6 Weeks after, in a Day much colder than us'd to be at that Time of the Year, the Air a little hazy, a little after One o'Clock, for about ½ an Hour, four Mock Suns were ſeen. Theſe Appearances are uſually differing in ſome Reſpect from one another.

A Glade of Light obſerv'd in the Heavens by Mr. Derham, *n.* 305. *p.* 2220. *Fig.* 2. *Plate* 2.

XIX. As I was obſerving the Immerſions of the 3d and 4th Satellites of *Saturn, March* 20 1706. I eſpy'd a very odd ſort of Light in the Conſtellation of *Taurus*, the lower end of which was below the *Bull's* Eye, and the other a good way above it, and the Star about the middle of the lower End thereof, as in *Fig.* 2. which doth repreſent its Appearance to me. This Glade of Light had the ſame Motion the Heavens had, and was much like the Tail of a Comet, but pointed at the upper end as in the Figure. This Light, I doubt not is ſuch as Dr. *Childrey* firſt obſerved in *England*, and which *Caſſini* and others firſt obſerv'd in *France*, as Dr. *Hook* ſaith; I look'd for it on the 26th, and 'twas gone.

A Northern Streaming in Ireland, *by Mr.* Neve, *commun. by Mr.* Derham. *n.* 320. *p.* 309.

XX. *Nov.* 16. 1707. After a froſty Morning, and a fair ſtill Day, Wind *N. W.* about ½ an Hour paſt 8 *P. M.* appeared a very ſtrange Light in the North: The Evening was clear and Star-light, only the Horizon was darkned with condens'd Vapours in the North, reaching I gueſs 10 or 15 Degrees above the Horizon. Out of this Cloud proceeded ſeveral *Streams* or *Rays of Light*, like the Tails of ſome Comets, broad below, and ending in Points above. Some of them extended almoſt to the Tail of *Urſa Minor*, and all were nearly perpendicular to the Horizon, and it was as bright as if the Full Moon had been riſing in the Cloud. But what I wondered at moſt, was the Motion of the dark and lighter Parts running ſtrangely through one another in a Moment; ſometimes to the *Eaſt*, and ſometimes to the *Weſt*. It continued after I ſaw it, about a Quarter of an Hour, often changing its Face and Appearance, as to Form and Light; ſometimes broken, ſometimes entire, and long Rays of Light in the clear Sky, quite ſeparate from, and above the Cloud, and none below in the Cloud.

Of the Luminous Appearance on the Wakes of

XXI. When the Ship ran apace, we often obſerved a great Light in the Wake of the Ship, or the Water that is broken and divided by the Ship in its Paſſage. Thoſe that did not view it nearly often attributed it

Ships in the Indian *Seas, by Father* Bourzes. *n.* 337. *p.* 231.

it to the Moon, the Stars, or the Lanthorn at the Stern; as I did my ſelf, when I firſt perceived it: But having a Window that look'd directly down upon it, I was ſoon undeceived; eſpecially when I ſaw it appear more bright, when the Moon was under the Horizon, the Stars covered with Clouds, and no Lights in the Lanthorn, or any other Light whatſoever caſt upon the Surface of the Water. This Light was not always equal; ſome Days it was very little, others not at all; ſometimes brighter, others fainter; ſometimes it was very vivid, and at other times nothing was to be ſeen.

As to its Brightneſs, perhaps you may be ſurprized when I tell you that I could eaſily read by it, tho I was 9 or 10 Foot above it from the Surface of the Water; as I did particularly *June* 12, and *July* 10. 1704. But I muſt inform you that I could read only the Title of my Book, which was in large Letters: Yet this ſeemed incredible to thoſe I told it to; but you may believe it, and I aſſure you that it is a real Truth.

As to the Extent of this Light, ſometimes all the Wake appeared Luminous to 30 or 40 Foot diſtance from the Ship; but the Light was very faint at any conſiderable Diſtance. Some Days one might eaſily diſtinguiſh in the Wake ſuch Particles as were Luminous from thoſe that were not: At other times there was no Difference. The Wake ſeemed then like a River of Milk, and was very pleaſant to look on; as it appear'd particularly on the 10th of *July* 1704. At ſuch times as we could diſtinguiſh the bright Parts from the others, we obſerved that they were not all of the ſame Figure: Some of 'em appear'd like Points of Light; others almoſt as large as Stars as they appear to the naked Eye. We ſaw ſome that looked like Globules, of a Line or two in Diameter; and others like Globes as big as ones Head. Oftentimes theſe *Phoſphori* form'd themſelves into Squares, of 3 or 4 Inches long, and one or two broad. Sometimes we could ſee all theſe different Figures at the ſame time; and particularly on the 12th of *June*, the Wake of the Veſſel was full of large *Vortices* of Light and theſe oblong Squares, which I have been ſpeaking of. Another Day, when our Ship ſailed ſlowly, the *Vortices* appeared and diſappeared again immediately like Flaſhes of Lightning.

Not only the Wake of a Ship produces this Light; but Fiſhes alſo in ſwimming leave behind 'em a luminous Tract; which is ſo bright that one may diſtinguiſh the Largeneſs of the Fiſh, and know of what Species it is. I have ſometimes ſeen a great many Fiſhes playing in the Sea, which have made a kind of artificial Fire in the Water that was very pleaſant to look on. And often only a Rope placed croſs-wiſe will ſo break the Water, that it will become luminous.

If one takes ſome Water out of the Sea, and ſtirs it never ſo little with his Hand in the dark, he may ſee in it an infinite number of bright Particles. Or if one dips a piece of Linnen in Sea Water, and twiſts or wrings it in a dark Place, he ſhall ſee the ſame thing; and if he does ſo, though it be half dry, yet it will produce abundance of bright Sparks. When one of the Sparkles is once formed, it remains a long time; and if it fix upon any thing that is ſolid, as for inſtance, on the ſide or edge of a Veſſel, it will continue ſhining for ſome Hours together. It is not always that this Light appears, tho' the Sea be in great Motion; nor does it always happen when the Ship ſails faſteſt: Neither is it the ſimple beating of the Waves againſt one another that produces this Brightneſs, as far as I could perceive: But I have obſerv'd that the beating of the Waves againſt the Shore, has ſometimes produced it in great plenty; and on the Coaſt of *Brazil* the Shore was one Night ſo very bright, that it appeared as if it had been all on Fire.

The Production of this Light depends very much on the Quality of the Water; and if I am not deceiv'd, generally ſpeaking, I may aſſert, other Circumſtances being equal, that the Light is largeſt when the Water is fatteſt and fulleſt of Foam; for in the main Sea the Water is not every where equally pure; and ſometimes if one dips Linnen into the Sea, it is clammy when it is drawn up again. And I have often obſerved, that when the Wake of the Ship was brighteſt, the Water was more fat and glutinous; and Linnen moiſten'd with it produced a great deal of Light, if it were ſtir'd or mov'd briskly. Beſides, in ſailing over ſome Places of the Sea, we find a Matter or Subſtance of different Colours, ſometimes red, ſometimes yellow, In looking at it, one would think it was Saw-duſt: Our Sailors ſay it is the Spawn or Seed of Whales. What it is, is not certain; but when we draw up Water in paſſing over theſe Places, it is always viſcous and glutinous. Our Mariners alſo ſay, That there are a great many Heaps or Banks of this Spawn in the North; and that ſometimes in the Night they appear all over of a bright Light, without being put in Motion by any Veſſel or Fiſh paſſing by them. But to confirm farther what I ſay, *viz.* That the Water, the more glutinous it is, the more it is diſpoſed to become luminous, I ſhall add one particular which I ſaw my ſelf. One Day we took in our Ship a Fiſh, which ſome thought was a *Boneta.* The inſide of the Mouth of the Fiſh appeared in the Night like a burning Coal; ſo that without any other Light, I could read by it the ſame Characters that I read by the Light in the Wake of the Ship. It's Mouth being full of a viſcous Humour, we rubbed a piece of Wood with it, which immediately became all over luminous; but as ſoon as the Moiſture was dried up, the Light was extinguiſh'd.

A Meteor in Yorkſhire, *by Mr.* Thoresby, *n.* 331. *p.* 322.

XXII. On *Holy Thurſday*, 1710. a flaming Sword as it was call'd, appear'd over the Town of *Leeds*, which at firſt I thought not worth obſerving, looking on it only as an hot and dry ſulphurous Exhalation, the natural Effect of ſo great a Drought. But I have ſince been with ſome who ſaw it, not only in the neighbouring Towns, but a great way North, as others did about 50 Miles South, of this place. It appear'd here at a quarter paſt 10 at Night, and took its Courſe from S. to N.

It was broad at one end, and ſmall at the other, and was by ſome thought to reſemble a Trumpet, and mov'd with the broad end foremoſt. Having my Window Curtains drawn, I ſaw only a ſudden Flaſh of Light; next day ſeveral Perſons were talking of the Appearance, which was ſo ſudden and bright, that they were ſtartled to ſee their own Shadows, when neither Sun nor Moon ſhone on them. All Perſons, tho' at many Miles diſtance from each other, thought it fell within 3 or 4 Furlongs of them, and that it went out with bright Sparklings at the ſmall end. An ingenious Clergyman told me, 'twas the ſtrangeſt *Deceptio Viſus* he was ever ſenſible of, if it was not abſolutely extinguiſh'd within a few Paces of him; yet others ſaw it many Miles farther North, in a few Moments. It has been likewiſe ſeen in the Counties of *Nottingham* and *Derby*, as well as *York* and *Lancaſter*.

A Pyramidal Appearance in the Heavens at Upminſter, *by Mr.* Derham, n. 310. p. 2411.

XXIII. I perceived in the Afternoon of *April* 3. 1707. in the Weſtern part of the Heavens, about a quarter of an Hour after Sun-ſet, a long ſlender *Pyramidal Appearance*, perpendicular to the Horizon. The *Baſe* of this *Pyramid* I judged to be doubtleſs the Sun (then below the Horizon,) Its *Apex* reacht 15 or 20 Degrees above the Horizon. It was throughout of a ruſty red Colour; and when I firſt ſaw it, pretty vivid and ſtrong; but the top part fainter much than the bottom, nearer the Horizon. At what time this Appearance began, whether at, or how ſoon after Sun-ſet, I cannot ſay, being at that time in a Friend's Houſe, But about a quarter of an Hour after Sun-ſet, as ſoon as I was gotten Abroad, I perceived it, and had for ſome time a fair Proſpect of it, the Horizon being pretty free and open where I then was. But after a while, it grew by Degrees weaker and weaker, ſo that in about a quarter of an Hour after I firſt ſaw it, the top part (*a. b. d.* in *Fig.* 3. *Pl.* 2.) was ſcarce viſible. But the lower part remained vivid much longer, but yet grew by degrees ſhorter and ſhorter. I ſaw the Remains of the lower half (*b. d. e. f.*) a full Hour after Sun-ſet; and ſhould perhaps have ſeen it longer, had the Horizon been open. But it was often in my Walk pent up with Trees, which not only obſtructed my Sight of the end of this unuſual Appearance, but alſo hindred me from an exquiſite Obſervation of all the Particulars that might probably occur.

The whole Atmoſphere ſeemed hazy, and full of Vapours, eſpecially towards the Sun-ſet. The Moon and Stars were that Evening bearded at that time, and ſucceeded with an *Halo* about the Moon afterwards. Which Diſpoſition of the Air was probably the Cauſe of the Phænomenon. But the Pyramid was undoubtedly imprinted upon the far diſtant Vapours of the Atmoſphere; it being manifeſtly farther off, or lying beyond ſome ſmall thin Clouds (*c. l. c. l.*) that intercepted it, and in thoſe parts covered and hid it. I have ſearched every Night ſince for this *Pyramis Veſpertina*, but have not ſeen it, nor any other unuſual Appearance, although the next Evening was hazy and likely.

An Aurora Borealis, by Dr. Halley, *v.* 347 *p.* 406.

XXIV. On *Tueſday Mar.* 6. 1716. (the Afternoon having been very ſerene and calm, and ſomewhat warmer than ordinary) about the Time it began to grow dark, that is much about 7 of the Clock, not only in *London*, but in all Parts of *England*, where the Beginning of this wonderful Sight was ſeen; out of what ſeemed a dusky Cloud, in the N.E. Parts of the Heaven, and ſcarce ten Degrees high, the Edges whereof were tinged with a reddiſh Yellow, like as if the Moon had been hid behind it, there aroſe very long, luminous Rays or Streaks perpendicular to the Horizon, ſome of which ſeem'd nearly to aſcend to the *Zenith*. Preſently after, that reddiſh Cloud was ſwiftly propagated along the Northern Horizon, into the N. W. and ſtill farther Weſterly; and immediately ſent forth its Rays after the ſame manner from all Parts, now here, now there, they obſerving no Rule or Order in their riſing. Many of theſe Rays ſeeming to concur near the *Zenith*, formed there a *Corona*, or Image which drew the Attention of all Spectators, who according to their ſeveral Conceptions made very different Reſemblances thereof; but by which compared together, thoſe that ſaw it not, may well comprehend after what manner it appeared. Some likened it to that Repreſentation of *Glory* wherewith our Painters in Churches ſurround the Holy *Name* of *God*. Others to thoſe radiating *Stars* wherewith the Breaſts of the *Knights* of the moſt Noble Order of the *Garter* are adorn'd. Many compared it to the *Concave* of the great *Cupola* of St. *Paul*'s *Church*, diſtinguiſht with Streaks alternately Light and Obſcure, and having in the middle a Space leſs bright than the reſt, reſembling the Lantern. Whilſt others, to expreſs as well the Motion as Figure thereof, would have it to be like the Flame in an Oven, reverberated and rouling againſt the arched Roof thereof: And ſome there were that thought it liker to that tremulous Light which is caſt againſt a Ceiling by the Beams of the Sun, reflected from the Surface of Water in a Baſon that's a little ſhaken, whoſe reciprocal vibrating Motion it very much imitated. But all agree that this *Spectrum* laſted only a few Minutes, and ſhow'd it ſelf variouſly tinged with Colours, Yellow, Red and a dusky Green. Nor did it keep in the ſame Place; for when firſt it began to appear, it was ſeen a little to the Northwards of the *Zenith*, but by Degrees declining towards the South, the long *Striæ* of Light, which aroſe from all Parts of the Northern Semicircle of the Horizon, ſeemed to meet together, not much above the Head of *Caſtor* or the Northern *Twin*, and there ſoon diſappeared.

After the firſt *Impetus* of this aſcending Vapour was over, the *Corona* we have been deſcribing appeared no more; but ſtill, without any order as to Time, or Place, or Size, luminous *Radii* like the former continued to ariſe perpendicularly, now oftner and again ſeldomer, now here, now there, now longer, now ſhorter. Nor did they proceed as at firſt out of a Cloud, but oftner would emerge at once out of the pure Sky, which was at that time more than ordinary ſerene and ſtill. Nor were they all of the ſame Form. Moſt of them ſeemed to end in a Point upwards, like erect Cones; others, like truncate Cones or Cylinders, ſo much reſembled the long Tails of Comets, that at firſt ſight they might well be taken for ſuch. Again, ſome of theſe Rays would continue viſible for ſeveral Minutes; when others, and thoſe the much greater part, juſt ſhew'd themſelves and died away. Some ſeem'd to have little Motion, and to ſtand as it were fix'd among the Stars, whilſt others with a very perceptible Tranſlation moved from Eaſt to Weſt under the Pole, contrary to the Motion of the Heavens; by which means they would ſometimes ſeem to run together, and at other Times to fly one another; affording thereby a ſurprizing Spectacle to the Beholders. After this Sight had continued about an Hour and a Half, thoſe Beams began to riſe much fewer in Number and not near ſo high, and by Degrees that diffuſed Light, which had illuſtrated the Northern Parts of the Hemiſphere, ſeemed to ſubſide, and ſettling on the Horizon formed the Reſemblance of a very bright *Crepuſculum*: That this was the State of this *Phænomenon*, in the firſt Hours, is abundantly confirmed by the unanimous Conſent and concurring Teſtimony of ſeveral very worthy Perſons, noways enclined to deceive. For by the Letters we have received from almoſt all the extream Parts of the Kingdom, there is found very little Difference in the Deſcription from what appeared at *London* and *Oxford*; unleſs that in the North of *England*, and in *Scotland*, the Light ſeemed ſomewhat ſtronger and brighter.

Hitherto I am forced to relate the Obſervations of others, wherein I fear many very material Circumſtances may be omitted: and aſſuredly am not a little concerned I had no notice of this Matter, till between 9 and 10 o' Clock. Being then at a Friend's Houſe, on the firſt Information of the thing we immediately ran to the Windows, which hapned to regard the *S.* and *S. W.* Quarter; and ſoon perceived, that though the Sky was very clear, yet it was tinged with a ſtrange ſort of Light; ſo that the ſmaller Stars were ſcarce to be ſeen, and much as it is when the Moon of four Days old appears after Twilight. And whilſt we regarded the Heavens with Attention, we perceived a very thin Vapour to paſs before us, which aroſe from the preciſe *Eaſt* part of the *Horizon*, aſcending obliquely, ſo as to leave the *Zenith* about 15 or 20 Degrees to the Northward. But the Swiftneſs wherewith it proceeded was ſcarce to be believed, ſeeming not inferiour to that of Lightning; and exhibiting, as it paſt on, a ſort of momentaneous *Nubecula*, which diſcovered it ſelf by a very diluted and faint Whiteneſs; and was no ſooner formed, but before the Eye could well take it, it was gone, and left no Signs behind it. Nor was this a ſingle Appearance; but for ſeveral Minutes that we regarded it, about ſix or ſeven times in a Minute, the ſame was again and again repeated; theſe Waves of Vapour (if I may be allowed to uſe the Word) regularly ſucceeding one another, and, as we gueſt, at intervals very nearly equal; all of them in their Aſcent producing a like tranſient *Nubecula*. By this Particular we were firſt aſſured, That the Vapour we ſaw, whatever it were, became conſpicuous by its own proper Light, without help of the Sun's Beams: For theſe *Nubeculæ* did not diſcover themſelves in any other part of their Paſſage, but only between the *South-Eaſt*, and *South*, where being oppoſite to the Sun they were deepeſt immerſt in the Cone of the Earth's Shadow; nor were they viſible before or after. Whereas the contrary muſt have happened, had they borrowed their Light from the Sun.

We then made all the haſte we could to a Place where there is a free Proſpect of the Northern Horizon. Being come there, not much paſt Ten of the Clock, we found, on the Weſtern Side, *viz.* between the W. and N. W. the Repreſentation of a very bright *Twilight*, contiguous to the Horizon; out of which there aroſe very long Beams of Light, not exactly erect toward the *Vertex*, but ſomething declining to the South, which aſcending by a quick and undulating Motion to a conſiderable Height, vaniſhed in a little time, whilſt others, tho' at uncertain Intervals, ſupply'd their Place. But at the ſame time, through all the reſt of the Northern Horizon, *viz.* from the North-Weſt to the true Eaſt, there did not appear any Sign of Light to ariſe from, or joyn to, the Horizon; but on the contrary, what appeared to be an exceeding black and diſmal Cloud ſeem'd to hang over all that part of it. Yet was it no Cloud, but only the ſerene Sky more than ordinary pure and limpid, ſo that the bright Stars ſhone clearly in it, and particularly *Cauda Cygni* then very low in the *North*; the great Blackneſs manifeſtly proceeding from the Neighbourhood of the Light which was collected above it. For the Light had now put on a Form quite different from all that we have hitherto deſcribed, and had faſhioned it ſelf into the Shape of two *Laminæ* or Streaks, lying in a Poſition parallel to the Horizon, whoſe Edges were but ill terminated. They extended themſelves from the *N.* by *E.* to the *North Eaſt*, and were each about a Degree broad; the undermoſt about eight or nine Degrees high, and the other about four or five Degrees over it; theſe kept their Places for a long time, and made the Sky ſo light, that I believe a Man might eaſily have read an ordinary Print by the Help thereof.

Whilſt we ſtood aſtoniſhed at this ſurprizing Sight, and expecting what was further to come, the Northern End of the upper *Lamina* by degrees bent downwards, and at length cloſed with the End of the other that was under it, ſo as to ſhut up on the Northſide an intermediate Space, which ſtill contiued open to the Eaſt. Not long after this, in the ſaid included Space, we ſaw a great number of ſmall Columns or whitiſh Streaks to appear ſuddenly, erect to the Horizon, and reaching from the one *Lamina* to the other; which inſtantly diſappearing were too quick for the Eye, ſo that we could not judge whether they aroſe from the Under or fell from the Upper, but by their ſudden Alterations they made ſuch an Appearance, as might well be taken to reſemble the Conflicts of Men in Battle. And much about the ſame time, to encreaſe our Wonder, there began on a ſudden to appear, low under the Pole and very near due North, three or four lucid *Areas* like Clouds, diſcovering themſelves, in the pure but very black Sky, by their yellowiſh Light. Theſe, as they broke out at once, ſo after they had continued a few Minutes, diſappeared as quick as if a Curtain had been drawn over them: Nor were they of any determined Figure, but both in Shape and Size might properly be compared to ſmall Clouds illuminated by the full Moon, but brighter.

Not long after this, from above the aforeſaid two *Laminæ*, there aroſe a very great *Pyramidal* Figure, like a *Spear*, ſharp at the Top, whoſe Sides were inclined to each other with an Angle of about four or five Degrees, and which ſeemed to reach up to the *Zenith* or beyond it. This was carried with an equable and not very ſlow Motion, from the N. E. where it aroſe, into the N. W. where it diſappeared, ſtill keeping in a perpendicular Situation, or very near it; and paſſing ſucceſſively over all the Stars of the *Little Bear*, did not efface the ſmaller ones in the Tail, which are but of the fifth Magnitude; ſuch was the extream Rarity and Perſpicuity of the Matter whereof it conſiſted. This ſingle Beam was ſo far remarkable above all thoſe that for a great while before had preceeded it; or that followed it, that if the Situation thereof among the Circumpolar Stars had at the ſame Inſtant been accurately noted, for Example, at *London* and *Oxford*, whoſe Difference of *Longitude* is well known, we might be enabled thereby with ſome Certainty to pronounce, by its *diverſitas Aſpectus*, concerning the Diſtance and Height thereof; which were undoubtedly very great, tho' as yet we can no ways determine them. But as this Phænomenon found all thoſe that are skill'd in the Obſervation of the Heavens unprepared, and unacquainted with what was to be expected; ſo it left all of them ſurpriz'd and aſtoniſhed at the Novelty thereof. When therefore for the future any ſuch thing ſhall happen, all thoſe that are curious in Aſtronomical Marters, are hereby admoniſhed and intreated to ſet their Clocks to the apparent Time at *London*, for Example, by allowing ſo many Minutes as is the Difference of Meridians; and then to note, at the end of every half Hour preciſely, the exact Situation of what at that time appears remarkable in the Sky; and particularly the *Azimuths* of thoſe very tall *Pyramids* ſo eminent above the reſt, and therefore likely to be ſeen furtheſt: to the Intent that by comparing thoſe Obſervations taken in the ſame Moment in diſtant Places, the Difference of their *Azimuths* may ſerve to determine how far thoſe *Pyramids* are from us.

It being now paſt Eleven of the Clock, and nothing new offering it ſelf to our View, but repeated *Phaſes* of the ſame Spectacle; we thought it no longer worth while to bear the Chill of the Night-air *ſub dio*. Wherefore being returned to my Houſe, I made haſte to my upper Windows, which conveniently enough regard the N. E. Parts of Heaven, and ſoon found that the two *Laminæ* or Streaks parallel to the Horizon, of which we have been ſpeaking, had now wholly diſappeared; and the whole Spectacle reduced it ſelf to the Reſemblance of a very bright *Crepuſ-*

culum ſettling on the Northern Horizon, ſo as to be brighteſt and higheſt under the Pole it ſelf; from whence it ſpread both Ways, into the N. E. and N. W. Under this, in the middle thereof, there appeared a very black Space, as it were the Segment of a leſſer Circle of the Sphere cut off by the Horizon. It ſeemed to the Eye like a dark Cloud, but was not ſo; for by the Teleſcope the ſmall Stars appeared through it more clearly than uſual, conſidering how low they were: and upon this as a *Baſis* our *Lumen Auroriforme* reſted, which was no other than a Segment of a Ring or Zone of the Sphere, intercepted between two parallel leſſer Circles, cut off likewiſe by the Horizon; or, if you pleaſe, the Segment of a very broad *Iris*, but of one uniform Colour; *viz.* a Flame-colour inclining to yellow, the Center thereof being about forty Degrees below the Horizon. And above this there were ſeen ſome Rudiments of a much larger Segment, with an Interval of dark Sky between, but this was ſo exceeding faint and uncertain that I could make no proper eſtimate thereof.

I was very deſirous to have ſeen how this Phænomenon would end, and attended it till near Three in the Morning, and the riſing of the Moon: but for above two Hours together it had no manner of Change in its Appearance, nor Diminution nor Encreaſe of Light; only ſometimes for very ſhort Intervals, as if new Fuel had been caſt on a Fire, the Light ſeem'd to undulate and ſparkle, not unlike the riſing of vaporous Smoak out of a great Blaze when agitated. But one thing I aſſured myſelf of by this Attendance and Watching, *viz.* that this *Iris*-like Figure did by no means owe its Origine to the Sun's Beams: for that about Three in the Morning, the Sun being in the middle between the North and Eaſt, our *Aurora* had not follow'd him, but ended in that very Point where he then was: whereas in the true North, which the Sun had long paſt, the Light remained unchanged and in its full Luſtre.

I have thought fit to annex a Figure exhibiting that particular Appearance of the two *Laminæ*, which I ſaw at *Londou* between the Hours of Ten and Eleven; more eſpecially, becauſe I do not find, among the many Relations I have ſeen, any one that has taken notice of it. In this Figure *A B* is the under *Lamina*, ſomewhat broader and brighter than the upper *C D*: it had near its under Edge the *Lucida Lyræ*, and below its Northern Extremity, on the Left-hand, *Cauda Cygni*: and as well above and below theſe, as in the intermediate Space between them, and indeed all round about that Part of the Heavens, the Sky was ſo unuſually dark and black, as if all that *exotick Light* that had ſhew'd it ſelf before, had been then collected into thoſe two Streaks. Only at *Q* between the Weſt and Northweſt and no where elſe, out of a Brightneſs adjoining to the Horizon, there aroſe conical Beams as *M, L, N*, after the ſame manner as at firſt.

Whilſt we ſtood looking on, the Streak *C D* at its Northern End bent downward, and joyned with the Under *A B* at *E*, and included the

Space *D C E A B*, which ſtill kept open at the other End towards the Eaſt. And in the mean time, out of the very clear Sky, ſome luminous Spots, ſituated and figured as in the Scheme at *G, G, G, G.* preſented themſelves to the Eye, in Colour much like the *Lamina*. Theſe did not ſhew themſelves all together, but came ſucceſſively, yet ſo as two or three of them were ſeen at a time; and as their coming was inſtantaneous, ſo they went away in a Moment. At the ſame time likewiſe, the ſeveral little white Columns marked *F, F, F, F,* occupied that Part of the Space between the two Streaks next to *E*, and by their ſudden and very irregular Motion, and the vaniſhing of ſome whilſt others at the ſame time emerged, gave occaſion to the Conception of thoſe that fancy'd Battles fought in the Air. Laſtly, from about the middle of *CD*, there aroſe ſuddenly a Cone or Obeliſk of a pale whitiſh Light, greater than any we had yet ſeen, as *H*; which moving from Eaſt to Weſt, with a Motion ſufficiently regular, was tranſlated to *K*, in the *North-Weſt*, and there diſappeared.

That we might by the ſame Scheme ſhew the Appearance of the laſt Hours, after Midnight; the Reader is deſired to take notice that we have made the Light at *Q*, much bigger than what appeared in the Weſt about Ten of the Clock; ſo as to repreſent truly that other. In this Caſe the Point *Q* muſt, by the Imagination, be ſuppoſed transferred to the Interſection of the Horizon and Meridian under the Pole. And that we might the better be underſtood in what follows, we have made this ſhort Recapitulation as annex'd to, and explicative of, the Scheme, which could by no means be contrived to anſwer the wonderful Variety this Phænomenon afforded; ſince even the Eye of no one ſingle Obſerver was able to follow it in the Suddenneſs and Frequency of its Alterations.

This was the only ſort of Meteor I had not as yet ſeen, and of which I began to deſpair, ſince it is certain it hath not happen'd to any remarkable Degree in this Part of *England* ſince I was born; nor is the like recorded in the *Engliſh Annals* ſince the Year of our Lord 1574, that is above One Hundred and Forty Years ago, in the Reign of Queen *Elizabeth*. Then, as we are told by the Hiſtorians of thoſe Times, *Cambden* and *Stow*, Eye-witneſſes of ſufficient Credit, for two Nights ſucceſſively, *viz.* on the 14th and 15th of *November* that Year, much the ſame wonderful Phænomena were ſeen, with almoſt all the ſame Circumſtances as now. Nor indeed, during the Reign of that glorious Princeſs, was this ſo rare a Sight as it has been ſince. For we find in a Book entituled, *A Deſcription of Meteors*, reprinted at *London* in the Year 1654, whoſe Author writes himſelf *W. F.* D. D. that the ſame thing, which he there calls *Burning Spears*, was ſeen at *London* on *January* 30. 1560; and again, by the Teſtimony of *Stow*, on the 7th of *October* 1564. And from foreign Authors we learn, that in the Year 1575. the ſame was twice repeated in *Brabant*, *viz.* on the 13th of *February* and 28th of *September*; and ſeen and deſcribed by *Cornelius Gemma*, Profeſſor of Medicine in the Univerſity of *Lovain*, and Son of *Gemma Friſius* the

Mathematician. He, in a Diſcourſe he wrote of the Prodigies of thoſe Times, after ſeveral ill-boding Prognoſticks, thus very properly deſcribes the *Cupola* and *Corona* that he ſaw in the *Chaſma* (as he calls it) of *February*. *Paulo poſt undecunque ſurgentibus Haſtis & flammis novis flagrare cælum a Borea parte uſque ad verticem videbatur: ac denique ne nihil quæ contigerunt hactenus præfiguratum antea videretur, converſa eſt Cæli facies, per horæ ſpatium, in Fritilli aleatorii ſpeciem peregrinam; alternantibus ſeſe cæruleo & candido, non minore vertigine motuſque celeritate, quam ſolares radii ſolent, quoties ab objecto ſpeculo regeruntur.* Here it is not a little remarkable, that all theſe four already mentioned fell exactly upon the ſame Age of the Moon, *viz.* about two Days after the Change.

As to the other of *September* 1575, theſe are the Words of *Gemma*. *Minus quidem horrendum, ſed varia tamen magiſque confuſa nobis apparuit alterius Chaſmatis forma, quarto Calendas* Octobris *ſubſecuti, ſtatim ab occaſu Solis. Nam in illo viſi ſunt arcus illuſtres plurimi, ex quibus Haſtæ ſenſim eminentes, Urbeſque turritæ & Acies militares. Erant hinc radiorum excurſus quaquaverſum, & nubium fluctus & prælia: inſectabantur invicem & fugiebant, facta in orbem converſione mirabili.* From hence 'tis manifeſt that this *Phænomenon* appeared in our Neighbourhood three ſeveral Times, and that with conſiderable Intervals, within the Compaſs of one Year; though our *Engliſh* Hiſtorians have not recorded the two latter; nor did *Gemma* ſee that of *November* 1574, as 'tis moſt likely by reaſon of Clouds. After this, in the Year 1580. we have the Authority of *Michael Mæſtlin*,* (himſelf a good Aſtronomer, and ſtill more famous for having had the honour to be the great *Kepler*'s Tutor in the Sciences) that at *Baknang* in the County of *Wirtemburg* in *Germany*, theſe *Chaſmata*, as he likewiſe ſtiles them, were ſeen by himſelf no leſs than ſeven times within the ſpace of twelve Months. The firſt of theſe, and moſt conſiderable, fell out on the very ſame Day of the Month with ours, *viz.* on *Sunday* the ſixth of *March*, and was attended with much the ſame Circumſtances. And again, the ſame things were ſeen in a very extraordinary manner on the 9th of *April* and 10th of *September* following: but in a leſs Degree, on the 6th of *April*, 21ſt of *September*, 26th of *December*, and 16th of *February* 1581: the laſt of which, and that of the 21ſt of *September* muſt needs have been more conſiderable than they appeared, becauſe the Moon being near the Full, neceſſarily effaced all the fainter Lights. Of all theſe however no one is mentioned in our Annals to have been ſeen in *England*, nor in any other place that I can find; ſuch was the neglect of curious Matters in thoſe Days.

* M. Mæſtlin. lib. de Cometa 1580.

The next in order that we hear of, was that of the Year 1621, on *September* the 2d, *ſt. vet.* ſeen all over *France*, and well deſcribed by *Gaſſendus* in his *Phyſicks*, who gives it the Name of *Aurora Borealis*. This tho' little inferiour to what we lately ſaw, and appearing to the Northwards both of *Rouen* and *Paris*, is no where ſaid to have been obſerved in *England*, over which the Light ſeemed to lie. And ſince then for above 80 Years, we have no Account of any ſuch Sight either from home or abroad; notwithſtanding that for above half that time, theſe *Philoſophical Tranſactions* have been a conſtant Regiſter of all ſuch extraordinary Occurrences. The firſt we find on our Books, was one of ſmall Continuance ſeen in *Ireland* by Mr. *Neve*,† on the 16th of *November* 1707. And in the *Miſcellanea Berolinenſia* publiſhed in 1710, we learn that in the ſame Year 1707, both on the 24th of *January* and 18th of *February*, *ſt. vet.* ſomething of this kind was ſeen by *M. Olaus Romer* at *Copenhagen*: and again on the 23d. of *February*, the ſame excellent *Aſtronomer* obſerved there ſuch another Appearance, but much more conſiderable; of which yet he only ſaw the Beginning, Clouds interpoſing. But the ſame was ſeen that Night by Mr. *Gotfried Kirch*, at *Berlin* above 200 Miles from *Copenhagen*, and laſted there till paſt Ten at Night. To theſe add another ſmall one of ſhort Duration, ſeen near *London*, a little before Midnight between the ninth and tenth of *Auguſt* 1708, by the Lord Biſhop of *Hereford*; ſo that it ſeems, in little more than eighteen Months this ſort of Light has been ſeen in the Sky, no leſs than five times; in the Years 1707 and 1708.

Hence we may reaſonably conclude that the Air or Earth, or both, are ſometimes, tho' but ſeldom and with great Intervals, diſpoſed to produce this Phænomenon: for though it be probable that many times, when it happens, it may not be obſerved, as falling out in the Day-time, or in cloudy Weather, or bright Moon-ſhine: yet that it ſhould be ſo very often ſeen at ſome times, and ſo ſeldom at others, is what cannot well be that way accounted for. Wherefore caſting about and conſidering what might be moſt probably the *Material Cauſe* of theſe Appearances; what firſt occurr'd was the Vapour of Water rarified exceedingly by ſubterraneous Fire, and tinged with ſulfureous Streams; which Vapour is now generally taken by our Naturaliſts to be the Cauſe of *Earthquakes*. And as Earthquakes happen with great Uncertainty, and have been ſometimes frequent in Places, where for many Years before and after they have not been felt; ſo Theſe, which we might be allowed to ſuppoſe produced by the Eruption of the pent Vapour through the Pores of the Earth, when it is not in ſufficient Quantity, nor ſudden enough to ſhake its Surface, or to open it ſelf a Paſſage by rending it. And as theſe Vapours are ſuddenly produced by the Fall of Water upon the nitro ſulphurous Fires under Ground, they might well be thought to get from thence a Tincture which might diſpoſe them to ſhine in the Night, and a Tendency contrary to that of Gravity; as we find the Vapours of *Gun-Powder*, when heated in *Vacuo*, to ſhine in the Dark, and aſcend to the Top of the Receiver though exhauſted: The Experiment of which I ſaw very neatly performed by Mr. *J. Whiteſide*, Keeper of *Aſhmole's Muſæum* in *Oxford*.

Nor ſhould I ſeek for any other Cauſe than this, if in ſome of theſe Inſtances, and particularly this whereof we treat, the Appearance had

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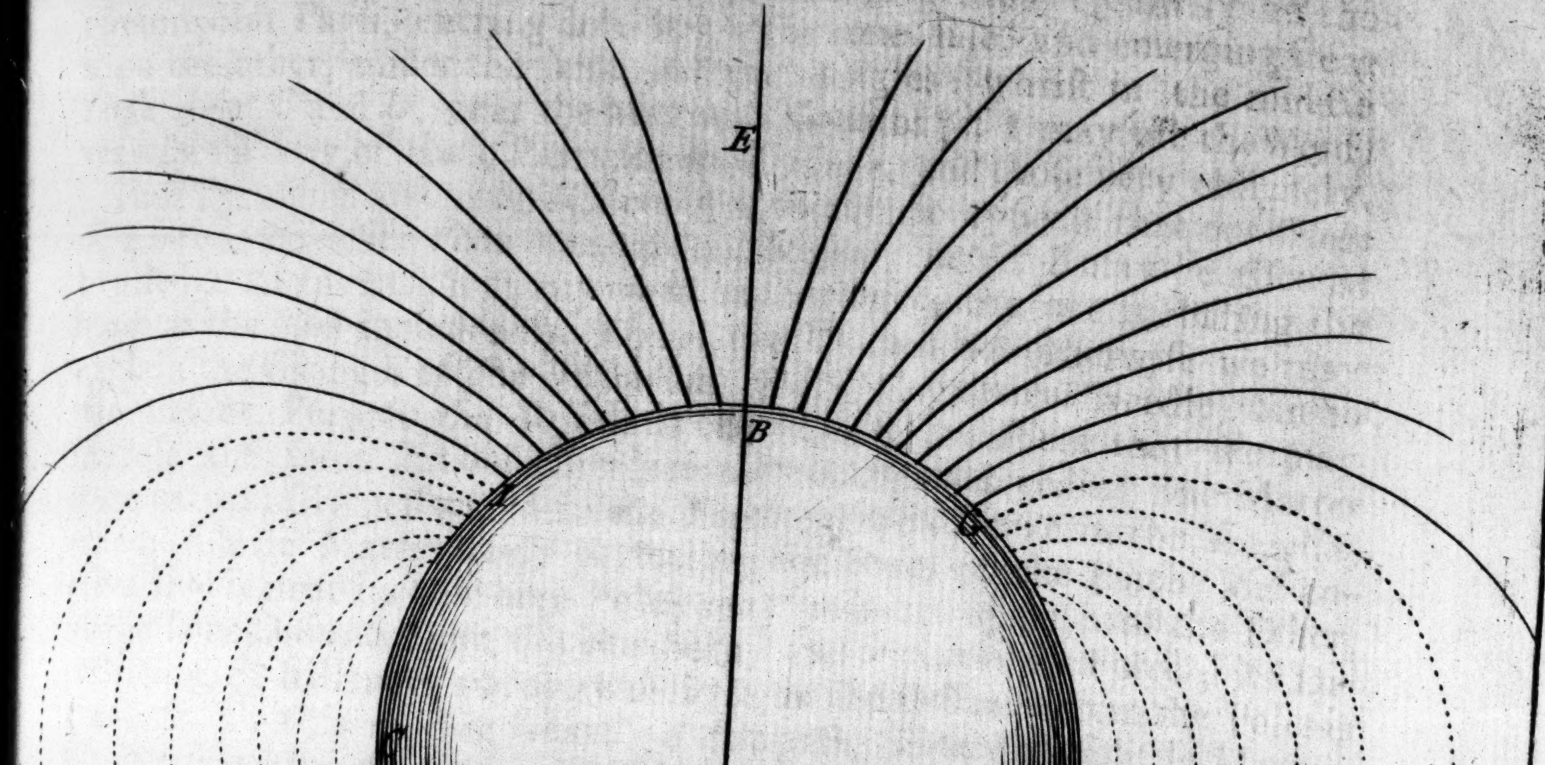
† *Phil. Tranſ.* n. 320. p. 310. ſupra. p. 112.

not been ſeen over a much greater Part of the Earth's ſurface than can be thus accounted for. It having in this laſt been viſible from the Weſt ſide of *Ireland* to the Confines of *Ruſſia* and *Poland* on the Eaſt (nor do we yet know its Limits on that Side) extending over at leaſt thirty Degrees of Longitude; and in Latitude, from about fifty Degrees over almoſt all the North of *Europe*; and in all Places exhibiting at the ſame time the ſame wonderous Circumſtances, as we are informed by the Publick News. Now this is a Space much too wide to be ſhaken at any one time by the greateſt of Earthquakes, or to be affected by the Perſpiration of that Vapour, which being included and wanting vent, might have occaſioned the Earth to tremble. Nor can we this Way account for that remarkable Particular attending theſe Lights, of being always ſeen on the Northſide of the Horizon, and never to the South.

Wherefore laying aſide all hopes of being able to explain theſe Things by the ordinary Vapours or Exhalations of the Earth or Waters, we are forced to have recourſe to other ſorts of *Effluvia* of a much more ſubtile Nature, and which perhaps may ſeem more adapted to bring about thoſe wonderful and ſurprizingly quick Motions we have ſeen. Such are the *Magnetical Effluvia*, whoſe Atoms freely permeate the Pores of the moſt ſolid Bodies, meeting with no Obſtacle from the Interpoſition of Glaſs or Marble, or even Gold it ſelf. Theſe by a perpetual Efflux do ſome of them ariſe from the Parts near the Poles of the Magnet, whilſt others of the like kind of Atoms, but with a contrary Tendency, enter in at the ſame parts of the Stone, through which they freely paſs; and by a kind of Circulation ſurround it on all Sides, as with an Atmoſphere, to the Diſtance of ſome Diameters of the Body. This thing † *des Cartes* has endeavour'd to explain by the *Hypotheſis* of the Circulation of certain ſkrewed or *ſtriate Particles*, adapted to the Pores they are to enter.

† Princip. Philoſ. *Lib.* VI.

But without enquiring how ſufficient the *Carteſian Hypotheſis* may be for anſwering the ſeveral Phænomena of the *Magnet*: that the Fact may be the better comprehended, we ſhall endeavour to exhibit the manner of the Circulation of the Atoms concerned therein, as they are expoſed to view by placing the Poles of a *Terrella* or *Spherical Magnet* on a Plane, as the Globe on the Horizon of a Right Sphere: Then ſtrewing fine Steel Duſt or Filings very thin on the Plain all round it, the Particles of Steel, upon a continued gentle knocking on the underſide of the Plain, will by degrees conform themſelves to the Figures in which the Circulation is performed. Thus in *Plate* 3. let *A B C D* be a *Terrella*, and its Poles *A* the South, and *B* the North; and by doing as preſcribed, it will be found that the Filings will lie in a Right Line perpendicular to the Surface of the Ball, when in the Line of the Magnetical Axis continu'd. But for about forty five Degrees on either ſide, from *B* to *G* or *I*, and from *A* to *H* or *K*, they will form themſelves into Curves, more and more crooked as they are remoter from the Poles; and withal more and more oblique to the Surface of the Stone: as our Figure truly repreſents, and as may readily be ſhewn by the *Terrella* and *Apparatus* for that Purpoſe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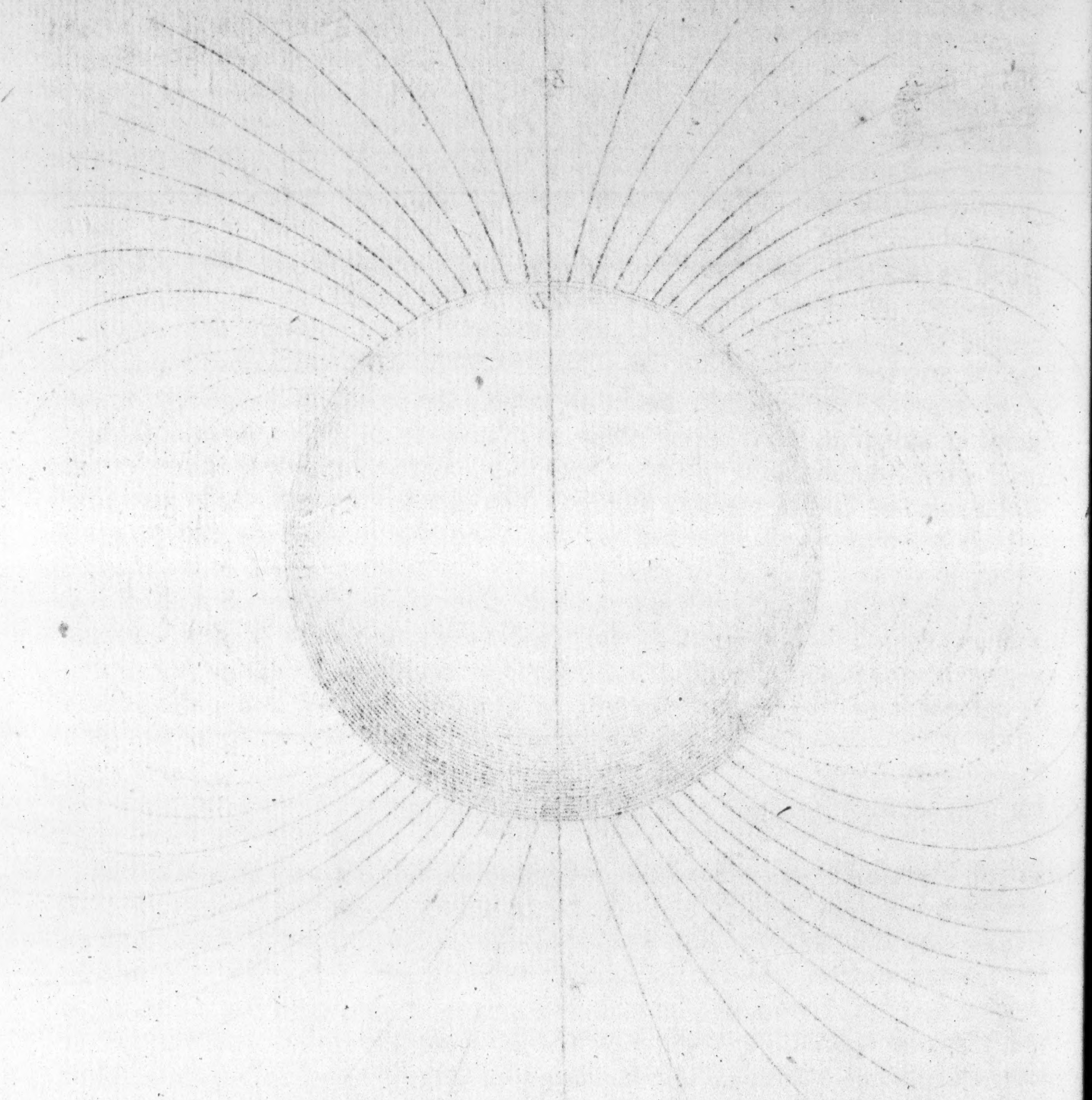

poſe in the *Repoſitory* of the *Royal Society*. Hence it may appear how this exceeding ſubtile Matter revolves; and particularly how it permeates the Magnet with more force and in greater Quantity in the circumpolar Parts, entring into it on the one ſide, and emerging from it on the other, under the ſame oblique Angles: whilſt in the middle Zone about *C* and *D*, near the Magnet's Equator (if I may uſe the Word) very few if any of theſe Particles do impinge, and thoſe very obliquely.

Now by many and very evident Arguments it appears that our *Globe* of *Earth* is no other than one great Magnet, or (if I may be allowed to alledge an Invention of my own) rather two; the one including the other as the *Shell* includes the *Kernel* (for ſo and not otherwiſe we may explain the Changes of the Variation of the Magnetical Needle) but to our preſent Purpoſe the Reſult is the ſame. It ſuffices that we may ſuppoſe the ſame ſort of Circulation of ſuch an exceeding fine Matter to be perpetually performed in the *Earth*, as we obſerve in the *Terrella*; which ſubtile Matter freely pervading the Pores of the Earth, and entring into it near its Southern Pole, may paſs out again into the Ether, at the ſame Diſtance from the Northern, and with a little Force; its Direction being ſtill more and more oblique, as the Diſtance from the Poles is greater. To this we beg leave to ſuppoſe, That this ſubtile Matter, no otherways diſcovering it ſelf but by its Effects on the Magnetick Needle, wholly imperceptible and at other times inviſible, may now and then, by the Concourſe of ſeveral Cauſes very rarely coincident, and to us as yet unknown, be capable of producing a ſmall Degree of Light; perhaps from the greater Denſity of the Matter, or the greater Velocity of its Motion: after the ſame manner as the *Effluvia* of *Electrick* Bodies by a ſtrong and quick Friction emit Light in the Dark: to which ſort of Light this ſeems to have a great Affinity.

This being allowed me, I think we may readily aſſign a Cauſe for many of the ſtrange Appearances we have been treating of, and for ſome of the moſt difficult to account for otherwiſe; as why theſe Lights are rarely ſeen any where elſe but in the North; and never, that we hear of, near the Equator: as alſo why they are more frequently ſeen in *Iceland* and *Greenland*, than in *Norway*, though nearer the *Pole* of the *World*. For the Magnetical Poles, in this Age, are to the Weſtward of our Meridian, and more ſo of that of *Norway*, and not far from *Greenland*; as appears by the Variation of the Needle this Year obſerved, full twelve Degrees at *London* to the Weſt.

The erect Poſition of the luminous Beams or *Striæ* ſo often repeated that Night, was occaſioned by the riſing of the Vapour or lucid Matter nearly perpendicular to the Earth's Surface. For that any Line, erected perpendicularly upon the Surface of the Globe, will appear erect to the Horizon of an Eye placed any where in the ſame ſpherical Superficies; as *Euclid* demonſtrates in a Plain, that any Line erected at Right Angles to it, will appear to be perpendicular to that Plain from any Point thereof. That it ſhould be ſo in the Sphere is a very pretty Propoſition, not very obvious, but demonſtrated from *Prop.* 5. *Lib.* I. *Theodoſii Sphæric.* For by it all Lines erect on the Surface paſs through the Center, where meeting with thoſe from the Eye, they form the Plains of Vertical Circles thereto. And by the Converſe hereof it is evident, that this luminous Matter aroſe nearly perpendicular to the Earth's Surface, becauſe it appeared in this erect Poſition. And whereas in this Appearance (and perhaps in all others of the kind) thoſe Beams which aroſe near the *Eaſt* and *Weſt*, as *L*, *M*, *N*, were furtheſt from the Perpendicular, on both ſides inclining towards the *South*, whilſt thoſe in the *North* were directly upright: the Cauſe thereof may well be explained by the Obliquity of the Magnetical Curves, making ſtill obtuſer Angles with the Meridians of the *Terrella*, as they are further from its Poles.

Hence alſo it is manifeſt how that wonderful *Corona* that was ſeen to the Southwards of the *Vertex*, in the Beginning of the Night, and ſo very remarkable for it's tremulous and vibrating Light, was produced; to wit, by the Concourſe of many of thoſe Beams ariſing very high out of the Circumjacent Regions, and meeting near the Zenith: the *Effluvia* whereof they conſiſted mixing and interfering one with another, and thereby occaſioning a much ſtronger but uncertain wavering Light. And ſince it is agreed by all our Accounts that this *Corona* was tinged with various Colours, 'tis more than probable that theſe Vapours were carried up to ſuch a Height, as to emerge out of the Shadow of the Earth, and to be illuſtrated by the direct Beams of the Sun: whence it might come to paſs that this firſt *Corona* was ſeen coloured and much brighter than what appeared afterwards in ſome Places, where the Sight thereof was more than once repeated, after the Sun was gone down much lower under the Horizon. Hence alſo it will be eaſily underſtood that this *Corona* was not one and the ſame in all Places, but was different in every differing Horizon: exactly after the ſame manner as the Rainbow ſeen in the ſame Cloud is not the ſame Bow, but different to every ſeveral Eye.

Nor is it to be doubted, but the Pyramidical Figure of theſe aſcending Beams is Optical: ſince according to all likelihood they are parallel ſided, or rather tapering the other way. But by the Rules of Perſpective, their Sides ought to converge to a Point, as we ſee in Pictures the Parallel Borders of ſtreight Walks, and all other Lines parallel to the Axis of Viſion, meet as in a Center. Wherefore thoſe Rays which aroſe higheſt above the Earth and were neareſt the Eye, ſeemed to terminate in Cuſps ſufficiently acute, and have been for that reaſon ſuppoſed by the Vulgar to repreſent *Spears*. Others ſeen from afar, and perhaps not riſing ſo high as the former, would terminate as if cut off with Plains parallel to the Horizon, like truncate Cones or Cylinders: theſe have been taken to look like the Battlements and Towers on the Walls of Cities fortified after the ancient manner. Whilſt others yet further off, by reaſon of their great Diſtance, good part of them being intercepted by the Interpoſition of the Convexity of the Earth, would only ſhew their pointed Tops, and becauſe of their Shortneſs have gotten the Name of *Swords*.

Next, the Motion of theſe Beams furniſhes us with a new and, as it ſeems to me, moſt evident Argument to prove the diurnal Rotation of the Earth: (though that be a matter which at preſent is generally taken by the Learned to be paſt Diſpute.) For thoſe Beams which roſe up to a Point, and did not preſently diſappear, but continued for ſome time, had moſt of them a ſenſible Motion from Eaſt to Weſt, contrary to that of the Heavens; the biggeſt and talleſt of them, as being neareſt, ſwifteſt; and the more remote and ſhorter, ſlower. By which Means, the one overtaking the other, they would ſometimes ſeem to meet and joſtle; and at other times to ſeparate, and fly one another. But this Motion was only Optical, and occaſioned by the Eye of the Spectator being carried away with the Earth into the Eaſt; whilſt the exceeding rare Vapour of which thoſe Beams did conſiſt, being as I take it, raiſed far above the Atmoſphere, was either wholly left behind, or elſe followed with but part of its Velocity, and therefore could not but ſeem to recede and move the contrary Way. And after the ſame manner as the Stars that go near the Zenith, paſs over thoſe Vertical Circles which border on the Meridian, much ſwifter than thoſe Stars which are more diſtant therefrom; ſo theſe luminous Rays would ſeem to recede faſter from Eaſt to Weſt, as their Baſes were nearer the Eye of the Spectator; and *e contra*, ſlower as they were further off.

Nor are we to think it ſtrange, if after ſo great a Quantity of luminous Vapour had been carried up into the Ether out of the Pores of the Earth, the Cauſe of its Effervеſcence at length abating, or perhaps the Matter thereof conſumed; theſe *Effluvia* ſhould at length ſubſide, and form thoſe two bright *Laminæ* which we have deſcribed, and whoſe Edges being turned to us were capable to emit ſo much Light that we might read by them. I chooſe to call them *Laminæ*, becauſe without doubt, though they were but thin, they ſpread Horizontally over a large Tract of the Earth's Surface. And whilſt this luminous Matter dropt down from the upper Plate to the under, the many little white Columns were formed between them by its Deſcent; only viſible for the Moment of their Fall. Theſe by the Swiftneſs with which they vaniſh'd and their great Number, ſhewing themſelves and diſappearing without any Order, exhibited a very odd Appearance; thoſe on the Right ſeeming ſometimes to drive and puſh thoſe on the left, and *vice verſa*.

I have been obliged to omit ſeveral Particulars of leſs Moment: But theſe are the principal Phænomena; of whoſe Cauſes I ſhould have more willingly and with more certainty given my Thoughts, if I had had the good luck to have ſeen the whole from Beginning to End; and to have added my own Remarks to the Relations of others: and eſpecially if we could by any Means have come at the Diſtances thereof. If it ſhall by any be thought a hard Suppoſition that I aſſume the *Effluvia* of the Magnetical Matter for this Purpoſe, which in certain Caſes may themſelves become luminous, or rather may ſometimes carry with them out of the Bowels of the Earth a ſort of Atoms proper to produce Light in the Ether. I anſwer, That we are not as yet informed of any other kinds of *Effluvia* of terreſtrial Matter which may ſerve for our purpoſe, than thoſe we have here conſidered, *viz.* the Magnetical Atoms, and thoſe of Water highly rarified into Vapour. Nor do we find any thing like it in what we ſee of the Celeſtial Bodies, unleſs it be the *Effluvia* projected out of the Bodies of Comets to a vaſt Height, and which ſeem by a *Vis centrifuga* to fly with an incredible Swiftneſs from the Centers both of the Sun and Comet, and to go off into Tails of a ſcarce conceivable Length. What may be the Conſtitution of theſe Cometical Vapours, we Inhabitants of the *Earth* can know but little, and only that they are evidently excited by the Heat of the Sun; whereas this Meteor, if I may ſo call it, ſeldom is ſeen but in the polar Regions of the World, and that moſt commonly in the Winter Months. But whatever may be the Cauſe thereof, if this be not, I have followed the old Axiom of the Schools, *Entia non eſſe temere neque abſque neceſſitate multiplicanda.*

† Abr. *Vol.* II. *p.* 616.

† *v.* Aſtronomy *ſupra.*

Laſtly, I beg leave on this Occaſion to mention what, near 25 Years ſince, I publiſhed in No. † 195. of theſe *Tranſactions, viz.* That ſuppoſing the *Earth* to be concave, with a leſſer Globe included, in order to make that inner Globe capable of being inhabited, there might not improbably be contained ſome luminous *Medium* between the Balls, ſo as to make a perpetual Day below. That very great Tracts of the Etherial Space are occupied by ſuch a ſhining *Medium* is evident from the Inſtances I have † already given. And if ſuch a *Medium* ſhould be thus incloſed within us; what ſhould hinder but we may be allowed to ſuppoſe that ſome parts of this lucid Subſtance may, on very rare and extraordinary Occaſions, tranſude through and penetrate the *Cortex* of our *Earth*, and being got looſe may afford the Matter whereof this our *Meteor* conſiſts. This ſeems favoured by one conſiderable Circumſtance, *viz.* that the *Earth*, becauſe of its diurnal Rotation, being neceſſarily of the Figure of a Flat *Spheroid*, the Thickneſs of the *Cortex*, in the *Polar* Parts of the Globe, is conſiderably leſs than towards the *Equator*; and therefore more likely to give Paſſage to theſe Vapours; whence a reaſon may be given why theſe Lights are always ſeen in the North. But I deſire to lay no more Streſs upon this Conceit than it will bear.

A Remark by Dr Robinſon, *n.* 349. *p.* 483.

2. I am alſo of opinion, that thoſe Phoſphorous or Luminous Appearances in the Firmament, proceed from the various *Effluvia* perſpir'd out of our Globe, or paſſing thro' it; for I have ſeen thoſe Lights over *Veſuvius*, the *Strombulo* Iſlands, and towards *Ætna* in dark Nights, when thoſe *Vulcano's* were not flaming nor burning, their Sides and Tops being paſſable to Travellers at that time, and all their outward parts quiet. We are certain that *Iceland* and *Greenland* abound with *Vulcano's*; ſo may North Eaſt *Lapland*, North *Ruſſia* and *Tartary*, where vaſt Chains of Mountains are ſaid to run. The *Jeſuits*, and other Travellers relate many prodigious Eruptions of Fires and Earthquakes towards the North of *China*; but nearer the Pole the Earth muſt be cloſ'd and pent up

many Months, by the long ſevere Freezings and continual Snow and Ice, which relaxing towards Spring, may give vent to that vaſt Maſs or Magazine of perſpirable Matter, that had been kept ſo long in hot Subterraneous Priſons. This may be one Reaſon why Animal Bodies themſelves are often ſenſible of Changes at that Seaſon in our Climate, when Perſpiration is upon ſuch an Increaſe.

n. 348 p. 430.

At *Paris*, the Light was ſo inconſiderable, that it was not regarded: But from a Letter to Mr. *Alexander Geekie*, Surgeon, dated on Board a Ship in *Nevis* Road, in *America*, *April* 19. 1716. we have copied the following Paſſage. ‘ On the ſixth of *March*, at 9 *P. M.* we being in the ‘ Latitude of 45°. 36′. (off of the *N. W.* Coaſt of *Spain*). A clear ‘ Cloud appeared *Eaſt* of us, not far diſtant from our Zenith, which af‘ terwards darted it ſelf forth into a number of Rays of Light, every ‘ way like the Tail of a Comet; of ſuch a great Length, that it reach'd ‘ within a ſhort way of the Horizon. There likewiſe appear'd a Body ‘ of Light, *N. N. E.* of us, and continued as Light almoſt as Day, till ‘ after 12 a Clock. It appear'd at a good diſtance from us, and darkned ‘ on a ſudden’.

Hence it ſhould ſeem, that the Vapour which cauſed this Appearance, aroſe indifferently out of the deep Ocean Sea, as well as from the Land; by which we may conclude the great Subtilty of the Matter thereof, ſince it could permeate ſo great a Quantity of Water, and yet retain its Velocity; which is a Circumſtance deſerving the further Conſideration of the Curious.

A Return of the ſame Appearance. ibid.

3. Since this, moſt of the ſame *Phænomena* have been repeated three ſeveral Nights ſucceſſively, *viz.* On the laſt of *March*, and firſt and ſecond of *April.* The beſt and fulleſt Deſcription of the two firſt, is from a Letter of Dr. *Brook Taylor*, *LL. D.* dated *April* 2. from *Cotterſtock*, near *Oundle* in *Northamptonſhire*, who thus deſcribes them. ‘ On ‘ *Saturday* Night laſt, and laſt Night, I ſaw Appearances of the ſame ‘ kind, with thoſe of *March* 6, but not to compare for Extent and ‘ Strength to the other. They both began ſoon after Sun-ſet, and con‘ tinued till after 12, but how much longer I cannot tell. They were ‘ both about 10 or 15 Degrees to the Weſtward of the *North*, and took ‘ up about 80 Degrees of the Horizon; and the *Aurora* roſe about 30 gr. ‘ high, with a dark Bottom, like what was ſeen in the firſt; and from ‘ whence there ſprung out ſeveral Bodies of Light, which immediately ‘ run into Streams, aſcending about 30, or at moſt 40 gr. high. There ‘ was no flaſhing nor waving Light, but in all other reſpects theſe ‘ Lights were of the ſame kind with what we ſaw at *London*. Indeed ‘ in that laſt Night, there was one *Phænomenon* like the flaſhing Light, ‘ for a Body of Light about 15 or 20 Degrees long, parallel to the ‘ Horizon, roſe till it came about 6 Degrees above the black Baſis, and ‘ then ſent up two ſtrong Streams of Light about 40 gr. high, which at ‘ top daſht againſt one another, and diſappear'd.’

At *London*, the firſt Night, *March* 31. It did not begin to radiate, till towards Mid-night, and was ſeen but by few curious Perſons; the

Beams not riſing very high, and ſcarce appearing over the Houſes, were little taken notice of: but by the Relation of thoſe that ſaw it, it was much more conſiderable than the next Night following *Eaſter-day*, for it then ſent out but few and very ſhort Beams, moſtly terminating in a ſharp Point, and preſently diſappearing. Only it beginning to ſtream ſo ſoon as it became Dusky, it was very obſervable, that thoſe Rays which aroſe out of the Weſt end of the luminous Arch, next the Sun, were enlightned by its Beams, and ſhew'd themſelves much brighter than thoſe which ſprung up under the Pole, or to the Eaſtward thereof. And after Nine, till Mid-night, no more Beams aroſe; and the luminous Arch with its black *Baſis*, ſettled down very low in the Northern Horizon.

The ſame two Nights, by the Obſervation of Mr. *William Lingen*, the like Appearance was ſeen at *Dublin*, about the Hours of Nine or Ten; at which time, in the former Night, it was near as Light as in a Moon-light Night. And from *France* we have an Account, that both thoſe Nights, the ſame was ſeen at *Paris*, with much the ſame Circumſtances as at *Dublin*. So that it ſeems this Meteor, though no ways comparable to that of the 6th of *March*, was ſeen not leſs than 150 Leagues, and probably much further.

The following Night, *April* 2. When it began to be dark, a luminous Arch appeared in the *North*, with a very narrow black Bottom under it, very low, and depreſs'd to the Horizon; nor was it ſeen at, or about *London*, to project any pointed Rays as the former.

But what was moſt remarkable that Evening was, what was ſeen at *London*, by that ingenious Gentleman *Martin Foulkes*, Eſq; *R. S. S.* about Nine that Night. He being in the open Air at that time, ſaw in an Inſtant, a bright Ray of very white Light, appear in the Eaſt, out of the pure Sky, then very ſerene and ſtill; it very much reſembled the Tail of a Comet, and was about 20 gr. inclined from the Perpendicular to the Right, beginning about γ of *Bayer* in the *Corona Borea*, and terminating about the *Informis*, by ſome called *Cor Caroli*. This having appeared but a very ſhort time, diſappeared at once, as in a Moment. When on a ſudden, ſuch another Beam was inſtantly produced, not exactly in the ſame place, but in the ſame Situation. Its lower end being about 20 gr. high, was terminated exactly between κ and γ, in the Right Hand and Arm of *Hercules*, and the Middle of it paſt over σ and ϱ in the Girdle of *Bootes*, and thence proceeded Weſtwards, leaving *Cor Caroli* four or five Degrees to the Northwards. After it had continued in this Poſture near 10 Minutes immoveable among the Stars, it began to move ſlowly towards the North: and the lower end paſſing over the Northern Edge of the *Crown*, and the Ray it ſelf over *Cor Caroli*, it grew fainter, and vaniſhed, having continued in all about 20 Minutes. This latter with ſome Interruption was extended between *Caſtor* and *Pollux*, very far into the Weſt. And about that time the ſame, or ſuch another Beam was ſeen at St. *Aſaph*, by Doctor *Stanley*, the Reverend Dean of that Church.

XXV. *Feb.*

Two late Northern Aurora's at Sutton *at* Hone *in* Kent, *n.* 351. *p.* 584.

XXV. *Feb.* 5. 171$\frac{6}{7}$. at 8 at Night, an *Aurora Borealis* appear'd. It occupied at leaſt a 6th or near a 5th part of the Horizon; it was low, and ſhot out bright Rays, and I believe would have appear'd very Light, had not the Moon then 5 Days old, ſhone at the ſame time, and the Aurora diſappeared before Sun-ſet.

Mar. 30. following, paſt Nine at Night, I ſaw another. 'Twas dim then, and its higheſt part cover'd the loweſt Star in *Caſſiopeia*'s Chair. It ſeem'd not due North, but one Point to the Weſt. About 10, it ſhot out bright Rays, high, and tending ſomewhat towards one another. Near it, there was (beſides the Northern Brightneſs) a long Streak, not very broad, extended E. and W. which beginning in the Serpent's Head, near *Hercules*'s Club, and covering *Arcturus*, proceeded near *Berenice*'s Hair and ſo went over *Cor Leonis*, thence to the *Canicula*, and ended a little below that Star. It ſhone very bright at firſt, but faded away in about 8 or 9 Minutes. If it had Motion, which I am not ſure of, it was Southward. I waited for the next Fit of Brightneſs of the Aurora, and in about 7 Minutes, the Eaſtern part of the Streak from the Serpent's Head to near *Berenice*'s Hair, became viſible again tho' dim, and was quite effac'd in 4 or 5 Minutes more, and I did not yet perceive any Change of its Place.

The latter obſerved at London *by* Martin Folkes *Eſq; n.* 352. *p.* 586.

XXVI. Being in the Street, between 8 and 9 a Clock on *Saturday* laſt, (30 *Martii*) I perceived a Light over the Houſes to the Northwards, little inferiour to that the Full Moon gives when ſhe firſt riſes. Upon this ſuſpecting ſome ſuch Meteor as we ſaw the laſt Year, I made all the haſte I could into the Fields, where I immediately found my Conjecture verified; and was for ſome time agreeably entertain'd with the ſight of an *Aurora Borealis*, attended with moſt of the *Phænomena* that have been deſcrib'd in that very remarkable one of the 6th of *March*, 1715-6.

The whole Northern part of the Horizon was in the ſame manner cover'd with ſomewhat reſembling a black Cloud, from behind which iſſu'd a very conſiderable Light, whoſe lower part was pretty well defin'd by the common Edge of the Cloud, but the upper dy'd away more gradually. This upper Limb of the Light reſembling the Arch of a Circle, whoſe higheſt Point between 9 and 10 of the Clock (when the Meteor was moſt conſiderable) was elevated about 12 Degrees, and bore as I imagin'd, about 20 deg. Weſtward of the due North. It touch'd the Horizon in the Weſt at the diſtance of about 65 or 70 Degrees from the North, whence the whole intercepted Arch of the Horizon would have been of near 100 Deg. had not ſome few Degrees in the Eaſt been hid by Clouds which lay between us and the Meteor.

The ſeeming black Cloud, when I firſt ſaw it, ran nearly parallel to the Horizon, and at the diſtance of 6 or 7 Degrees: but in about half an Hour it changed its Figure very much, ſinking down in the North to about half its height, and riſing in the Weſt near as much. What I principally took notice of this for, was that the Light iſſuing from behind it did not change with it, but remain'd of the ſame Figure, however the Cloud approached or receded from differing Parts of its Limb.

There aroſe at firſt ſome Streams in the *N. N. W.* but of no conſiderable Length, few of them paſſing 5 Degrees above the Arch; but beginning from behind the ſeeming Cloud, ſo as to be about 12 Degrees high in all. They were pointed at the Ends, and nearly vertical to the Horizon. Between times there was nothing but the Arch to be ſeen, and that only reſembling a common *Aurora*; and again in an Inſtant, by a ſort of tremulous Motion, ſeveral Parts of it would appear converted into a vaſt number of parallel Streams, for the moſt part very little higher than the Arch it ſelf. About 20 Minutes before Ten, a ſmall part of the Arch, almoſt due North, grew remarkably lighter than the reſt, and continued to encreaſe for about half a Minute; when there ſuddenly broke out ſome very tall Streams of at leaſt 60 Degrees high, as I found by one in particular which aroſe full North, and paſſing over the Pole Star it ſelf, reach'd ſome Degrees beyond it. This was the moſt remarkable time of the Appearance, ſome ſuch Lances, though not ſo high, immediately ſhooting out of the Place that firſt of all radiated, as did ſome more a good way to the Eaſt. They were all nearly Perpendicular to the Horizon, and moſt of them did ariſe quite from the black Subſtance at Bottom, tho' I ſaw ſome few that did not reach ſo low, appearing as if their lower Parts had been broken off. Some of them were full as bright as any I ſaw the laſt Year, the Axes (if I may ſo call them) of ſome of the talleſt Streams coming up very near to the Colour of that pale Fire we ſee in ſome ſorts of Lightning. About this time the Ground Weſtward was all covered with an odd ſort of Miſt, the ſame from which I remember laſt Year a great many People ſaid there came an ill Smell, which I did not at all perceive; however as I remember it to be the very ſame Appearance, I thought it might not be improper juſt to take notice of it.

About 10 the *Phænomenon* very much decreas'd, and ſo continued till after 11, only ſending up now and then 2 or 3 Streams. At half an Hour after 11 it was again pretty much encreas'd, and I ſaw it again ſend out ſome Streams almoſt as conſiderable as any I had before ſeen this Evening; the Arch yet continued, but not ſo entire; and from what I could judge, its middle was ſome Degrees nearer the North than when I firſt took notice of it. Till a quarter of an Hour before 12 the light continually abated, and then I left it; but a Watchman, I order'd to bring me an Account of it next Morning, tells me it continued till towards Day-break, but never ſtream'd remarkably after I went away. Tho' I could not this time ſee any Stars through the black Matter at Bottom, I am ſenſible it was not a Cloud, though it bore the Reſemblance of one: for when a real Cloud (as ſeveral ſmall ones did) came over any part of it, their Difference was very conſpicuous.

I have ſince receiv'd two Letters, one from *Wisbich* in the Iſle of *Ely*, the other from within 14 Miles of the *Bath*, both which take notice of it, though with no further Particulars, than that on *Saturday* Night they had ſeen the ſame Light, though not ſo conſiderable as in the beginning of *March* the laſt Year.

Another at London by Dr. Halley, *n.* 363. *p.* 1099.

XXVII. 1. Upon *Tueſday*, *November* 10. 1719. in the Morning, *Jupiter* applying to the ſecond in the Wing of *Virgo*, I got up about 5 of the Clock to obſerve him, and having had the Satisfaction to ſee my Calculus perfectly well anſwer the Heavens, I found certain white Streaks in the Sky, ſeemingly Perpendicular; which whilſt I conſidered them ſeemed inſtantly to vaniſh, and ſoon after others came as inſtantaneouſly in their room. I began to imagine that this was likely to be ſome part of the *Phænomena* of the *Aurora Borealis*. But there appearing nothing like that luminous Arch which we have of late ſo often ſeen in the *North*, I knew not what to think; till looking up towards the *Zenith*, I perceived an entire *Canopy* of ſuch kind of white *Striæ*, ſeeming to deſcend from a white Circle of faint Clouds, about 7 or 8 Degrees in Diameter, which Circle ſometimes would vaniſh on a ſudden, and as ſuddenly be renewed. I obſerv'd that the Center of this place of Concourſe was not preciſely in the *Zenith*, but rather 14 Degrees to the Southwards thereof; which I was well enabled to eſtimate by a Star, which on each return thereof ſhewed its ſelf about the Center of the Circle. This Star is the 33d Star of the *Great Bear* in *Tycho*'s Catalogue, whoſe diſtance from the Pole at this time is 52½ Degrees, and which about half an Hour paſt Five that Morning paſt the Meridian, ſo that thoſe Rays centred very nearly on the Meridian it ſelf. It was a very entertaining Sight, till ſuch time as the Day-break began to obſcure theſe Lights, which were but faint, though ſufficiently diſtinguiſhable. They came none of them lower than about 30 or 40 Degrees of Altitude, and ſeemed not to have aſcended from the Horizon. The Sky was perfectly ſerene and calm, which ſeems to be one of the concomitant Circumſtances attending the *Aurora Borealis*, of which this was certainly a Species. For the Night following a Neighbour gave me notice of a ſtrange ſtreaming of Lights ſeen in the Air, which thereupon I attended from the Hours of 9½ to 11, when a Fog came ſo thick as to put an end to my Proſpect. But during that whole time there aſcended out of the *E. N. E.* and *N. E.* a continued Succeſſion of whitiſh *Striæ*, ariſing from below; and after changing as it were into a ſort of luminous Smoke, paſt over head with an incredible Swiftneſs, not inferiour to that of Lightning; and as it paſt, in ſome part of its Paſſage, ſeemed as it were gilded, or rather as if the Smoke had been ſtrongly illuminated by a blaze of Fire below. Some of the *Striæ* would begin high in the Air, and a whole ſet of them ſubordinate to one another, like Organ Pipes, would preſent themſelves with more rapidity than if a Curtain had been drawn from before them; ſome of which would die away where they firſt appeared, and others change into a luminous Smoke, and paſs on to the Weſtwards with an immenſe Swiftneſs. And I am of Opinion, that had it not been for the Moon, then ten Days old and very bright, this for the time would have been reckoned as conſiderable an Appearance as that of the 6th of *March*, 1716.

The ſame in Devonſhire, *by Mr.* William Maunder, *n.* 363 *p.* 1101.

2. On *Monday* the 26th of *October* between 7 and 8 in the Evening, at *Cruwys Morchard* in *Devonſhire*, I ſaw ſome ſmall Appearance of it, *viz.* 3 or 4 large Coruſcations in form of Pyramids, of reddiſh Colour, inclining to Yellow, which roſe about 50 Degrees above the Horizon, and continued but few Minutes. But the North part of the Hemiſphere was very bright and red all the Evening both before and after, till 10, if not longer.

Tueſday, *November* 10. Theſe Lights were ſeen again about 4 in the Morning, of which ſome ſay (to uſe their own Expreſſions) that the Element opened ſometime at one place, then at other; from whence came great ſhining Lights that continued a while, and then went away by Degrees, and the Holes cloſed up again. This continued till Day break.

The Evening following coming from *Tiverton* about half an hour after Eight, I ſaw the North part of the Horizon very light and reddiſh (notwithſtanding the Moon being about 10 Days old, was then in or paſt the Meridian, and ſhone very bright) in a ſhort time the ſtreaming luminous Rays began to appear very plain, ſome in one ſhape, ſome another, many of them like Cones or Pyramids, but moſt of them baldly terminated; ſome of which mounted very high, almoſt to the Zenith, to which place, or near, they all or moſt ſeemed to point. Shortly after there appeared a long Streak of about 30 Degrees, parallel to the Horizon, and about 15 or 20 diſtant from it, and about 2 or 3 broad, but baldly terminated and of a fiery red Colour: which ſent out ſome of the ſame ſtreaming Beams towards the Zenith. About 6 or 7 Minutes after there appeared (ſomewhat ſudden) a Circular Figure like an Iris, but twice as broad, of a pale Colour. The Eaſt part was terminated by the Horizon at full Eaſt, if not ſomething to the South, and the Weſt End about North Weſt; the upper part of its Arch being 50 or 60 Degrees high, great numbers of luminous Rays darted from upward and downwards, (or elſe paſſing croſs it from the Horizon) at oblique Angles pointing to the Zenith, eſpecially from the North Eaſt part. This continued, as near as I can gueſs (by the diſtance I rode) about 8 or 9 Minutes, when it divided and diſappeared. After an Interval of 3 or 4 Minutes, another Iris-like Figure appeared, (of a Colour (as it ſeemed) paler than any of the ſtreaming Lights had been) whoſe Diameter was leſs than that of the former, and ſhewed more than its Semicircle above the Horizon, the upper part of its Arch approaching near the Zenith. I could not obſerve any Rays to paſs from, (or a croſs) this as from the other. The Centre of this laſt was much more to the Weſt than that of the firſt. After the Continuance of a Minute or two, it began to break in the upper part of its Arch, and ſhining Particles being ſent out from both its broken Ends towards the Zenith, (to which they were near before) or rather a little beyond it to the South or South Weſt, they there formed a ſort of *Corona*, curving and bending ſomewhat like Flames reverberated on the Arch of an Oven: tho' this expreſſeth it but badly, yet I know not how to deſcribe it better. It ſeemed to me and others to be finely tinged with various Colours, Red, Yellow and Blueiſh, *&c.* and ſent out every way from it (except South and South-weſt) long Flame coloured Rays. After this had continued about two Minutes, its ſhining Light abated, and it left behind it for ſome Minutes, ſomething like a whitiſh Cloud (like in Colour to what the Light on the 19th of *March* laſt left behind it, after the fiery Particles were extinguiſhed, but thinner.)

All this while the Moon ſhone out very bright, from which this *Corona* was not very far diſtant, perhaps not twenty Degrees, to the North Eaſt. After this there continued to be ſent up many fiery colour'd or yellowiſh ſtreaming Lights, ſometimes more, ſometimes leſs, now here, now there, all along the North part of the Hemiſphere, but moſtly from the North Eaſt. All this while ſomething like ſmall whitiſh Clouds (which to me ſeemed to move towards the Zenith, or to point a little more Southward; but diſappear'd as they approached the Moon) were carried very ſwiftly, and at very ſhort Intervals, moſtly coming from the Eaſt and North Eaſt, but many alſo from North and North Weſt. We took but little notice of this at firſt, ſuppoſing it had been nothing but the Reflection of the other Lights, or the Shadows of the Clouds (whereof the North parts were pretty full) as the Streams of Light paſt behind them: But at laſt we obſerved that when the Lights at any time abated, theſe kind of Clouds continued to fly as ſwift and frequent as ever. This I ſaw till 12 or 1 next Morning: many others ſaw it next Morning till almoſt break of Day, when it appeared much more red and fiery than it was in the Evening; the Moon perhaps being then ſet. Some People obſerv'd tall Cones to ariſe in the Eaſt, and to be carryed to the Weſt, pretty ſwiftly in an erect Poſition, but I ſaw them not.

The ſame in Dublin, by an unknown hand, ib. p. 1104.

3. The Afternoon was very Calm and Serene; about ſix in the Evening the Sky was tinged with a ſtrange kind of Light, and ſome Streams began to project from the North and North Eaſt. One of them aroſe about N. by E. and was nearly a Subtenſe of an Arch between that and South Weſt by Weſt; it was a little curvated toward the Sun, and what I ſaw of it (for the North part of the Horizon was conceal'd by Houſes) very much reſembled the Tail of a Comet: About the ſame time there was one or two which aroſe in the Eaſt, aſcending obliquely ſo as to leave the *Zenith* ſeveral Degrees to the Northward.

Theſe *Striæ* continu'd to appear and diſappear alternately till toward Eight in the Evening; they were *Pyramidal*, and their *Vertices* frequently projected ſeveral Degrees to the South of our *Zenith*.

Between 9 and 10 I was agreeably ſurpriz'd with a kind of Coruſcation, or Flaſhing, that ſhew'd it ſelf between twenty and ſixty Degrees from the *Zenith*, in the South or South by Weſt; and which from four or five, ſometimes from more places at once, darted with a Velocity not much inferior to that of Lightning; and by interfering with each other produc'd a beautiful Tremour or Undulation in that ſubtile *Vapour*, which I cannot better illuſtrate, than by comparing it to the Beams of the Sun, reflected on a Ceiling from the Surfaces of two or three Baſons of Water: Theſe *Waves* of Light were only viſible at the Inſtant of Coruſcation, and were of a pale whitiſh Colour, ſomewhat reſembling the Flaſhes produced by the violent Agitation of Quickſilver in an exhauſted Receiver, but ſo ſtrong that a Gentleman who about that time was in a Room by himſelf, without a Candle, aſſur'd me he took it for common Lightning: Thus it continued inceſſantly for more than an Hour, during which time ſeveral lucid *Areas*, like little Clouds, diſcover'd themſelves in the pure Sky, and after they had continued about five or ſix ſecond Minutes, as near as I could gueſs, would inſtantaneouſly diſappear; moſt of them pretty much reſembled a very thin white Smoke or Vapour illuminated by the Full Moon.

About three quarters paſt 10, this Vapour was almoſt ſpent, or by a brisk Gale at South by Weſt diſpers'd and driven to the Northward; at which time, between the Weſt and North, a vaſt body of it, like a very bright Flame-colour'd *Crepuſculum*, ſeem'd to be fix'd: From this Baſis ſeveral Beams or *Striæ* of ſhining matter were at uncertain Intervals emitted; and tho' it was not ſenſible to the Eaſtward of the North, yet ſeveral mighty Pillars were alſo ejected from thence: one, which if I miſtake not, aroſe directly under the Pole, was, above all others that had preceeded it, both as to its Magnitude and Denſity ſo ſurprizing, that I'm perſuaded the ſmalleſt Print might have been read by the Light thereof, had not that of the Moon, which ſhone very bright, pretty much effac'd it: 'twas ting'd with a kind of yellow and violet Colour. In about two or three Minutes it died away, and was ſucceeded by others of an inferior Order: It was now about a quarter paſt Eleven of the Clock, and nothing but repeated *Phaſes* of the ſame Spectacle offering themſelves to View; the Vibrating Motion had ceaſed; the Vapour ſhewed it ſelf no longer in lucid *Areas*; the Streams of Light were not ſo frequent, and thoſe more languid than before; and the bright *Aurora* having ſettled nearer the Horizon, I concluded the *Scene* was at an End, and accordingly gave over the Queſt of new *Phænomena*, with only obſerving that about N.E. there appeared ſome Clouds that reflected an unuſual kind of reddiſh Light. Others, who through a Principle of Fear ſat up longer than I did, repreſent the End with very ſurprizing Circumſtances; but as it eſcap'd the Eyes of thoſe who were beſt qualified to oblige the World with an Hiſtory of it, ſo I deſpair of adding any thing that may be ſatisfactory: and there were no doubt many Circumſtances of weight that I did not obſerve: for the wonderful Variety this *Phænomenon* afforded, and the frequency and ſuddenneſs of its Alterations, made it impoſſible for the Eye of any ſingle Perſon to trace it.

On *Tueſday* the *24th* of *November*, we had the ſame *Phænomena* repeated, though not with the ſame Variety: About a quarter paſt ten at Night, a vaſt Body of ſhining matter was collected between N. W. by Weſt, and N. by E. in the form of the Segment of a Circle, whoſe Center was abour 25 or 30 Degrees below the Horizon; from its *Periphery* a few ſhort *Pyramidal* Streams, of the ſame luminous Vapour, aſcended by a ſlow and nearly uniform Motion, and were exceeding rare ſo as not to efface the ſmalleſt of the fix'd Stars; and in a Minute or two vaniſhed: It was very remarkable that the Light which that Collection of Vapour emitted was ſo great, that in the otherwiſe very dark night, I cou'd thereby (at three quarters paſt Ten) read the Title of the laſt *Philoſ. Tranſact.* which then happened to lye on my Desk; and at four or five Yards diſtance ſee the ſmalleſt Books in my Study.

Another at Streatham *in* Surry, *by Mr.* Tho. Hearne, *n.*363. *p.*1107.

XXVIII. I had the Pleaſure to find the Obſervations made upon the above deſcrib'd Appearance very agreeable to what I had my ſelf obſerved the Evening of that Day: and to what I did not at that time obſerve, but had an Opportunity of obſerving in the night of *December* 11. I believe much more plainly than Dr. *Halley* had in the night of *November* 10.

December 11. about one a Clock at night (or rather in the Morning of *December* 12) I was called to obſerve Coruſcations which appeared of a much different Colour, and in a very different manner from any I had before ſeen.

The Streams of Light that darted upwards from the Horizon ſeemed to be at conſiderably a greater diſtance, but not at all in leſs quantity than thoſe of *November* 10. But their meeting in a Point near the *Zenith*, and there forming a kind of *Canopy*, was what was particularly remarkable in the *Manner* of the Coruſcations now different from thoſe of *November* 10.

The Streams of Light roſe from the Horizon only towards the North, and on each hand towards N. Eaſt and N. Weſt: But near the *Zenith* a Canopy was formed of Streams of Light meeting in a Point, not only from thoſe Quarters, but alſo from the South, *&c.* Only to thoſe Points they extended downwards from the *Zenith* but a little Way, and were neither in ſo great quantity nor quite ſo bright as thoſe Northwards. At firſt I thought the Point in which the Streams met was exactly the *Zenith*, but upon obſerving it ſomething longer, I found it was not ſo, but a few Degrees to the South of the *Zenith*. The Streams of Light near the *Zenith*, which formed this Canopy, were of a pretty bright Colour, and in great Quantity, and darted very ſwiftly.

On each ſide of the N. towards E. and W. but not exactly in the N. it ſelf (at leaſt when I ſaw it) from about 10 or 15° to 40 or 50° above the Horizon, the Streams were of a glowing red Colour, whereas all that I had ever ſeen before were very pale. The Redneſs was like that of a burnt Brick, and neareſt of any thing I have ſeen to the Colour, which remained for a few Minutes, like that Tract through which the Meteor paſſed in the Spring.

The Streams appeared of this fierce Colour when I firſt ſaw the Coruſcations, and continued ſo for ſome time, till the Redneſs by Degrees wearing off, in about $\frac{1}{4}$ of an Hour they appeared of the uſual Paleneſs, when I left them ſtill forming a Canopy near the Zenith, as is above deſcrib'd. The Air was very calm and ſerene, not a Breath of Wind ſtirring.

The Moon was now a Day or two older than it was *November* 10. and a good deal farther to the W. than when I ſaw the Coruſcations, that Night being then near full South. She had now round her what is commonly call'd a Burr, larger than ordinary, and ſeveral lucid Clouds at a little diſtance.

Several extraordinary Meteors or Lights in the Sky. By Dr. Edmund Halley, *n.* 341. *p.* 159.

XXIX. The *Theory* of the Air ſeemeth at preſent to be perfectly well underſtood, and the differing Denſities thereof at all Altitudes, both by Reaſon and Experiment are ſufficiently defined; for ſuppoſing the ſame Air to occupy Spaces reciprocally proportional to the Quantity of the ſuperior or incumbent Air, I have elſewhere proved that at 40 Miles high the Air is rarer than at the Surface of the Earth about 3000 times; and that the utmoſt Height of the Atmoſphere, which reflects Light in the *Crepuſculum*, is not fully 45 Miles. Notwithſtanding which, 'tis ſtill manifeſt that ſome ſort of Vapours, and thoſe in no ſmall Quantity, ariſe nearly to that Height. An Inſtance of this may be given in the great Light the Society had an account of from Dr. *Wallis*, which was ſeen in very diſtant Counties almoſt over all the South part of *England*. Of which though the Doctor could not get ſo particular a Relation, as was requiſite to determine the Height thereof, yet from the diſtant Places it was ſeen in, it could not but be very many Miles high.

v. Phil. Tranſ. n. 135. *p.* 863 *Abr. Vol.* II. *p.* 200.

So likewiſe that Meteor which was ſeen in 1708. on the 31*ſt* of *July*, between Nine and Ten a Clock at Night, was evidently between 40 and 50 Miles perpendicularly high, and as near as I can gather, over *Shereneſs* and the *Buoy on the Nore*. For it was ſeen at *London* moving horizontally from *E.* by *N.* to *E.* by *S.* at leaſt 50 Degrees high, and at *Redgrave* in *Suffolk*, on the *Yarmouth* Road, about 20 Miles from the Eaſt Coaſt of *England*, and at leaſt 40 Miles to the Eaſtward of *London*, it appeared a little to the Weſtwards of the South, ſuppoſe *S.* by *W.* and was ſeen about 30 Degrees high, ſliding obliquely downwards. I was ſhown in both Places the Situation thereof, which was as deſcribed. We may ſecurely conclude, that it was not many Miles more Weſterly than *Redgrave*, which as I ſaid before, is above 40 Miles more Eaſterly than *London*. Suppoſe it therefore, where perpendicular, to have been 35 Miles Eaſt from *London*; and by the Altitude it appear'd at in *London*, *viz.* 50 Degrees, its Tangent will be 42 Miles, for the Height of the

Meteor above the Surface of the Earth; which alſo is rather of the leaſt, becauſe the Altitude of the Place ſhewn me, is rather more than leſs than 50 Degrees: and the like may be concluded from the Altitude it appear'd in at *Redgrave*, near 70 Miles diſtant. Though at this great Diſtance, it appear'd to move with an incredible Velocity, darting in a very few Seconds of Time, for about 12 Degrees of a great Circle from North to South, being very bright at its firſt Appearance: and it died away at the End of its Courſe, leaving for ſome time a pale Whiteneſs in the Place, with ſome Remains of it in the Track where it had gone; but no hiſſing Sound as it paſt, or Bounce of an Exploſion were heard.

It may deſerve the Honourable Society's Thoughts, how ſo great a Quantity of Vapour ſhould be raiſed to the very Top of the Atmoſphere, and there collected, ſo as upon its Accenſion or otherwiſe Illumination, to give a Light to a Circle of above 100 Miles Diameter, not much inferior to the Light of the Moon; ſo as one might ſee to take a Pin from the Ground in the otherwiſe dark Night. 'Tis hard to conceive what ſort of Exhalations ſhould riſe from the Earth, either by the Action of the Sun or ſubterranean Heat, ſo as to ſurmount the extream Cold and Rareneſs of the Air in thoſe upper Regions: But the Fact is indiſputable, and therefore requires a Solution.

Like to this, but much more conſiderable, was that famous Meteor which was ſeen to paſs over *Italy March* 21. *O. S. Anno* 1676. about an Hour and ¾ after Sun-ſet, which happen'd to be obſerved and well conſider'd by the famous Profeſſor of Mathematicks in *Bononia Geminian Montanari*, as may be ſeen in his *Italian* Treatiſe about it, ſoon after publiſh'd at *Bononia*. He obſerves that at *Bononia*, its greateſt Altitude in the *S.S.E.* was 38 Degrees, and at *Siena* 58 to the *N.N.W.* that its Courſe by the Concurrence of all the Obſervers was from *E. N. E.* to *W. S. W.* that it came over the *Adriatick* Sea as from *Dalmatia*: that it croſt over all *Italy*, being nearly vertical to *Rimini* and *Savigniano* on the one Side, and to *Leghorn* on the other: that its perpendicular Altitude was at leaſt 38 Miles: that in all Places near this Courſe, it was heard to make a hiſſing Noiſe as it paſſed, *Ronzare, Far ſtrepito comme un fuoco artificiale, Fiſciare per aria comme un Raggio di polve*; that having paſt over *Leghorn*, it went off to Sea towards *Corſica*, and laſtly, that at *Leghorn* it was heard to give a very great Blow, *Tuono di maggior rumori di groſſa Cannonata*; immediately after which another ſort of Sound was heard like the ratling of a great Cart running over Stones, which continued about the time of a *Credo*.

He concludes from the apparent Velocity it went on with at *Bononia*, at above 50 Miles Diſtance, that it could not be leſs ſwift than 160 Miles in a Minute of Time, which is above ten times as ſwift as ths diurnal Rotation of the Earth under the Equinoctial, and not many times leſs than that wherewith the annual Motion of the Earth about the Sun is performed. To this he adds the Magnitude thereof, which appeared at *Bononia* bigger than the Moon in one Diameter, and above half as big again in the other; which with the given Diſtance of the Eye, makes its real leſſer Diameter above half a Mile, and the other in Proportion. This ſuppoſed, it cannot be wondred that ſo great a Body moving with ſuch an incredible Velocity through the Air, though ſo much rarified as it is in its upper Regions, ſhould occaſion ſo great a hiſſing Noiſe, as to be heard at ſuch a Diſtance as it ſeems this was. But 'twill be much harder to conceive, how ſuch an *impetus* could be impreſſed on the Body thereof, which by many Degrees exceeds that of any Cannon Ball; and how this *impetus* ſhou'd be determined in a Direction ſo nearly parallel to the Horizon; and what ſort of Subſtance it muſt be, that could be ſo impelled and ignited at the ſame time; there being no *Vulcano* or other *Spiraculum* of ſubterraneous Fire in the *N. E.* parts of the World, that we ever yet heard of, from whence it might be projected.

I have much conſidered this Appearance, and think it one of the hardeſt things to account for, that I have yet met with in the *Phænomena* of *Meteors*, and am induced to think that it muſt be ſome Collection of Matter form'd in the *Æther*, as it were by ſome fortuitous Concourſe of Atoms, and that the Earth met with it as it paſt along in its Orb, then but newly formed, and before it had conceived any great *Impetus* of Deſcent towards the Sun. For the Direction of it was exactly oppoſite to that of the Earth, which made an Angle with the Meridian at that time (the Sun being in about 11 Degrees of *Aries*) of 67 Gr. that is, its Courſe was from *W. S. W.* to *E. N. E.* wherefore the *Meteor* ſeem'd to move the contrary Way: And beſides falling into the Power of the Earth's Gravity, and loſing its Motion from the Oppoſition of the *Medium*, it ſeems that it deſcended towards the Earth, and was extinguiſh'd in the *Tyrrhene Sea*, to the *W. S. W.* of *Leghorn*. The great Blow being heard upon its firſt Immerſion into the Water, and the ratling like the driving a Cart over Stones, being what ſucceeded upon its quenching; ſomething like which is always obſerved upon quenching a very hot Iron in Water.

Mr. *Gottfried Kirch*, in an Appendix to his *Ephemerides* for the Year 1688, gives us this remarkable Relation of much ſuch another Appearance.

Die 9 Jul. ſt. vet. 1686. *Hora* $1\frac{1}{2}$ *matutina, Globus ardens cauda præditus in* $8\frac{1}{2}$ *Gr. Aquarii & 4 Gr. Sept. apparuit, qui per ſemiquadrantem Horæ immotus perſtitit, cujus diameter ſemidiametrum Lunæ circiter æquabat. Primo lux tanta erat, ut ejus ope ſine candelis legere potuiſſemus: poſtea pedetentim in loco ſuo evaneſcebat. Phænomenon iſtud dicto tempore multis aliis in locis pariter viſum eſt, præſertim* Schlaizii, *oppido undecim milliaribus Germanicis abhinc (i. e. a* Lipſia) *verſus Meridiem diſtante, altitudine circiter 60 Gr. ab Horizonte meridiano.* At the time of this Appearance the Sun was in $26\frac{1}{2}$ Gr. of ♋, and by the given Place of the Meteor, 'tis plain, it was ſeen about $\frac{3}{4}$ of an Hour paſt the Meridian, or in S. by W. and by its Declination it could not be above 24 Degrees high at *Leipſic*, though the ſame at *Schlaize* was about 60 Gr. high: The Angle therefore at the Meteor was about 36 Gr. whence by an eaſy *calculus* it will be found, that the ſame was not leſs than 16 German Miles diſtant in a right Line from *Leipſick*, and above 6$\frac{1}{2}$ ſuch Miles perpendicular above the Horizon, that is at leaſt 30 Engliſh Miles high in the Air. And though the Obſerver ſays of it, *immotus perſtitit per ſemiquadrantem horæ*; 'tis not to be underſtood that it kept its Place like a fixt Star, all the time of its Appearance; but that it had no very remarkable progreſſive Motion. For himſelf has at the End of the ſaid *Ephemerides* given a Figure of it, which he has marked *Fig. D.* whereby it appears that it darted downwards obliquely to the Right Hand, and where it ended, left two Globules or Nodes, not viſible but by an Optick Tube.

The ſame Mr. *Gottfried* † *Kirch* gives us a Relation of ſuch another luminous Meteor ſeen likewiſe at *Leipſick* on the 22*d* of *May* 1680. *ſt. vet.* about three in the Morning, which though himſelf ſaw not, was yet there obſerved by divers Perſons who made various Reports of it, but the more intelligent agreed that it was ſeen deſcending in the North, and left behind it a long white Streak where it had paſt. At the ſame time at *Haarburgh* the like Appearance was ſeen in *N.E.* or rather *N.N.E.* as alſo at *Hamburgh*, *Lubeck* and *Stralſund*, all which are about 40 *German* Miles from *Leipſick*: but in all theſe Places, by Perſons unacquainted with the manner of properly deſcribing things of this kind. So that all we can conclude from it is, that this Meteor was exceeding high above the Earth, as well as the former.

All the Circumſtances of theſe *Phænomena* agree with what was ſeen in *England* in 1708, but it commonly ſo happens that theſe contingent Appearances eſcape the Eyes of thoſe that are beſt qualified to give a good Account of them. 'Tis plain however that this ſort of luminous Vapour is not exceedingly ſeldom thus collected.

Meteor ſeen all over England, March 19. 1718-9. *By Dr.* Halley, *n.* 360. *p.* 978.

XXX. Since the foregoing Diſcourſe was writ, turning over the *Ephemerides* of *Kepler*, I accidentally hit upon another, prior to all thoſe above deſcribed, and which was ſeen all over *Germany*. Of this the Words of *Kepler* are: *Die* $\frac{7}{17}$ *Nov.* 1623. *Meteorum ignitum, Globus ardens ab occaſu in ortum volans tota paſſim* Germania *fuit conſpectus.* *In* Auſtria *etiam fragorem exauditum affirmarunt quaſi a fulmine; quod vanum tamen puto: nihil enim tale confirmant deſcriptiones quæ extant.* Yet neither this, nor any of the other hitherto deſcribed, ſeem to come up in any Circumſtance to this late Appearance; of which I am in hopes to give a ſatisfactory Account, being enabled by the very many Relations thereof communicated to the *Royal-Society*, from moſt parts of the Kingdom; though it was not my good Fortune to ſee it my ſelf; and though very few of our Countrymen who beſt know the *Stars*, had better luck.

Firſt, Our very worthy Vice-Preſident Sir *Hans Sloan*, Baronet, being abroad at that time, happened to have his Eyes turned towards it, in its very firſt Eruption; and the next Day he was pleaſed to give me in Writing what he had with great Exactneſs noted about it, in the Terms following: 'On *Thurſday*, *March* 19, 17$\frac{18}{19}$, paſſing along Eaſtward by

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[†] Newe Himmels Zeitung. Nurenb. 1681. verſ. prin.

the N. E. Corner of *Southampton-ſtreet* in *Bloomsbury-Square, London,* at about a Quarter after Eight at Night, I was ſurpriz'd to ſee a ſudden great Light, much beyond that of the Moon, which ſhone then very bright. I turn'd to the Weſtward where the Light was; which I apprehended at firſt to be artificial Fire-works or Rockets. The firſt place I obſerv'd it in, was about the *Pleiades* Northerly, whence it moved after the manner, but more ſlowly than a falling Star, in a ſeeming direct Line, deſcending a little beyond, and withal below, the Stars in *Orion's Belt* then in the S. W. The long Stream appear'd to me to be branched about the middle, and the *Meteor* in its way turn'd Pear-faſhioned or tapering upwards. At the lower end it came at laſt to be bigger and Spherical, though it was not ſo big as the Full Moon. The Colour of it was whitiſh, with an Eye of Blue, of a moſt vivid dazling Luſtre, which ſeem'd in Brightneſs very nearly to reſemble, if not ſurpaſs that of the Body of the Sun in a clear Day, beheld by the naked Eye. This Brightneſs obliged me to turn my Eyes (which had their Pupils adapted to the Light of the Moon) from it ſeveral times, as well when it was a Stream, as when it was Pear-faſhion'd and a Globe; tho' I had a great Curioſity to obſerve it with Attention. It ſeem'd to move in about half a Minute or leſs, about the Length of 20°, and to go out, as I gueſs'd, about as much above the Horizon. There was left behind it, where it had paſs'd, a Track of a cloudy or faint reddiſh yellow Colour, ſuch as red-hot Iron or glowing Coals have, which remained more than a Minute, ſeem'd to ſparkle, and kept its Place without falling. This Track was interrupted, or had a Chaſm towards its upper end, at about two Thirds of its Length. I did not hear any Noiſe it made, but the place where the Globe of Light had been, remain'd, after it was extinct, of the ſame reddiſh yellow Colour with the Stream for ſome time, and at firſt ſome Sparks ſeem'd to iſſue from it, ſuch as come from red-hot Iron beaten on an Anvil. The Surprize, Brightneſs of the Light, and Noiſe of the People upon the Variations of the Appearance, calling to one another to obſerve what they never had obſerv'd in their Days, and thought to be prodigious, hinder'd me from taking notice or remembring any thing farther about it'.

All the Relations, however otherwiſe differing, agree in this, that the Splendour was little inferior to that of the Sun; that within Doors the *Candles* gave no manner of Light, and in the Streets not only all the *Stars* diſappear'd, but the *Moon* then nine Days old, and high near the Meridian, the Sky being very clear, was ſo far effaced as to be ſcarce ſeen, at leaſt not to caſt a Shade, even where the Beams of the Meteor were intercepted by the Houſes: ſo that for ſome few Seconds of Time, in all reſpects it reſembled perfect Day.

The Time when this happen'd was generally reckoned at a quarter paſt Eight; but by the more accurate Account of the Reverend Mr. *Pound* (who only ſaw the Light) agreeing with what has been ſent us from the *Pariſian*

Poriſian Obſervatory, it appears to have been at 8h. 8′ apparent Time at *London.* And the Sun being then in $9\frac{1}{2}$ *gr.* of *Aries,* the Right Aſcenſion of the Mid-Heaven was 130 *gr.* 45′, whereby the Poſition of the Sphere of fixt Stars is given. Hence the *Lucida Pleiadum* will be found at that time to have been $25\frac{1}{4}$ *gr.* high, in an *Azimuth* 6 *gr.* to the Northward of the Weſt, and conſequently the Arch the Meteor moved in, was inclined to the Horizon with an Angle of about 27 *gr.* having its Node or Interſection therewith, nearly *South South Weſt*; as will be more evident by what follows. At *Oxford* five Minutes earlier, Mr. *John Whiteſide,* R. S. *Soc.* Keeper of the *Aſhmole Muſeum,* and very skilful in both Mathematical and Phyſical Matters, immediately after the Extinction of the Meteor, made haſte out to ſee what it might be, and well conſider'd the Situation of the Track it had left in the Sky: He found it to have paſt about $1\frac{1}{2}$ Degree above the preceding Shoulder of *Orion,* and about $3\frac{1}{2}$ *gr.* above the middle of his *Belt,* where there appear'd a luminous *Nubecula* of reddiſh Light, being a Dilatation of the Track, ſeeming to have been occaſioned by ſome Exploſion there; and by what he could learn from thoſe that ſaw it, it was thereabout that it broke out, and firſt began to efface the Stars. Hence it proceeded as to ſenſe in an Arch of a great Circle, and paſſing in the middle between the Tail of *Lepus* (θ *Bayero*) and β in the Fore-Foot of *Canis major,* it terminated about ξ in the Breaſt of the ſame, nearly in 95 *gr.* of Right-Aſcenſion, with 23 *gr.* South Declination: and at the place of its Extinction there remained a large whitiſh *Nebula,* much broader and of a ſtronger Light than the reſt of the Track, which he took for a certain Indication of a very great Exploſion made there. By Computation it will be found that the Angle this Track made with the Horizon of *Oxford* was neareſt 40 *gr.* and its Interſection due *S. S. W.* and that the place of its Extinction was about 9 *gr.* above the Horizon, in the Azimuth of 32 *gr.* to the *Weſt.* At *Worceſter* Mr. *Nicolas Fatio,* a Perſon greatly skill'd in Aſtronomical Affairs, ſaw this Meteor deſcend obliquely towards the *South,* making an Angle with the Horizon of about 65°, and interſecting it about *S. S. W.* $\frac{1}{2}$ *S,* as may be collected from a Scheme thereof ſent up by him, and communicated to the *Royal Society,* ſeeming to be deſign'd with ſufficient Exactneſs. By this the Track left all *Orion* and *Canis major* to the Weſtward, and divided the Diſtance between *Sirius* and *Procyon,* ſo as to be almoſt twice as far from *Procyon* as *Sirius.* The Time here was one Minute before Eight, this City being about 9′ of Time to the Weſt of *London,* and conſequently the Right-Aſcenſion of the Mid-Heaven $128\frac{1}{2}$ *gr.*

Now the Situation of the three Cities, *London, Oxford,* and *Worceſter* being nearly on the ſame *W. N. W.* Point, whereon the Track of the Meteor had its greateſt Altitude above the Horizon, equal to the Angle of its viſible Way; if we ſuppoſe it at *London* to have been 27 *gr.* high, and at the ſame time at *Worceſter* to be 65 *gr.* high, in the Plane of the Vertical Circle paſſing through *London* and *Worceſter*; ſuppoſing likewiſe the Diſtance between them to be 99 Geographical Miles, or one

Degree and half of an Arch of a great Circle of the *Earth*, we ſhall by a Trigonometrical *Calculus*, too obvious to be here inſerted, find the perpendicular Height to have been 64 ſuch Miles; and the Point over which it was then perpendicular to have been 30 ſuch Miles *W. N. W.* from *Worceſter*. And the Geographical Mile to the *Engliſh* Statute Mile being as 23 to 20, this Height will be no leſs than 73½ *Engliſh* Miles. The place alſo directly under it will be found to be about *Preſtain* on the Confines of *Hereford* and *Radnor*-Shires. Nor can we be much out in this Determination, the *Oxford* Obſervation concurring nearly in the ſame Concluſion.

This Altitude being added to the Semidiameter of the Earth as *Radius*, becomes the *Secant* of Eleven Degrees, ſo that the Meteor might be ſeen above the Horizon in all Places not more than 220 Leagues diſtant from it. Whence it will not be ſtrange that it ſhould be ſeen over all Parts of the Iſlands of *Great Britain* and *Ireland*, over all *Holland* and the hither Parts of *Germany*, *France* and *Spain*, at one and the ſame inſtant of Time.

This ſuggeſts a very great uſe that might be made of theſe momentaneous Phænomena, to determine the *Geographical Longitudes* of Places. For if in any two Places two Obſervers, by help of *Pendulum* Clocks duly corrected by Cœleſtial Obſervation, do exactly note at what Hour, Minute and Second ſuch a Meteor as this blows up and is extinguiſht, the Difference of thoſe Times will be the Difference of Longitude of the two Places, as is well known. Nor does it require ſo much as the Uſe of a *Teleſcope*, as in the Methods hitherto put in Practice for that Purpoſe; ſo that if theſe Appearances could be predicted, and notice given of their coming, that we might know when to expect them, I ſhould make no Difficulty to prefer this way of ſettling the *Geography* of a Country before all others.

Having thus fixt one Point in the Line of its Motion, let us now conſider what courſe the Meteor took from thence. And firſt at the Town of *Kirkby-Stephens*, on the Borders of *Yorkſhire* and *Weſtmoreland*, in a Meridian very little to the Weſtward of *Worceſter*, but about 2½ *gr.* more to the North, it was obſerv'd to break out as from a duſky Cloud, directly under the Moon, and from thence to deſcend, nearly in a Perpendicular, almoſt to the Horizon. Now the Moon being at that time in the third Degree of *Leo*, was about half an Hour paſt the Meridian, and conſequently much about a point to the Weſt, or *S.* by *W.* and the Situation of *Preſtain* from *Kirby Stevens* being ſufficiently near upon the ſame Point, it follows that the Direction of the Track of the Meteor was according to the great Circle paſſing over thoſe two Places. And this is further confirm'd by the Obſervation of *Sam. Cruwys*, Eſq; *Reg. Soc. Soc.* who at *Tiverton*, about twelve Geographical Miles nearly due North from *Exeter*, obſerved the firſt Exploſion of this Meteor exactly in his Zenith, as he was aſſured by applying his Eye to the ſide of his Door, which he took to be perpendicular, and looking upwards: And from thence he ſaw it deſcend to the Southwards directly in the ſame Azimuth, without declining either to the Right or Left; hence it is plain, that the Track likewiſe paſs'd over this Place, which by our beſt Maps is found to lie in a Line with *Preſtain* and *Kirby-Stevens* with ſufficient Exactneſs; ſo that we ſhall take it for granted that this was the very Courſe it held.

On this Suppoſition, that the firſt Exploſion, attended with the reddiſh *Nubecula*, was directly over *Tiverton*, we have the *Oxford* Obſervation to compare with it, in order to determine more nicely the perpendicular Altitude there. At *Oxford* this *Nubecula* was found to be 3½ *gr.* above the middle Star of *Orion*'s *Girdle*, at 8h. 3′, and was therefore 26½ *gr.* above the Horizon; and the Diſtance between *Oxford* and *Tiverton* being 1°. 55′ or 115 Geographical Miles: it will be as the Sine of 61°. 35′ to the Sine of 63° 30′. ſo the Semidiameter of the Earth being 3437¾ ſuch Miles, to 3498 Miles diſtance of the Meteor from the Center of the Earth; from which deducting the Semidiameter, there remains 60¼ Geographical Miles for the height of the Meteor above *Tiverton*: And that this was ſo is confirmed by the Obſervation of the Reverend Mr. *William Derham*, who at *Windſor* ſaw the aforeſaid *Nubecula* about two degrees above the moſt Southerly of the Seven Stars in the Shield of *Orion*; that is (the Time being 8h. 6′) in the Altitude, of 23½ *gr.* whence, the diſtance between *Tiverton* and *Windſor* being 150 meaſur'd Miles, or 130 Geographical, by a like Proportion we ſhall find the ſame Height of the Meteor 60 ſuch Miles, wanting only one Quarter. So that in a round Number we may conclude it to have been juſt 60 Geographic or 69 Statute Miles above the Earth's Surface. Nor is it poſſible to come at a preciſe Determination of this matter, by reaſon of the Coarſeneſs and Inaccuracy of our *Data*, which were only the Notes of Perſons under the Surprize of the Suddenneſs of the Light, and no ways pretending to Exactneſs: however, ſuch as they are, they abundantly evince the height thereof to have exceeded 60 *Engliſh* Miles, not to ſay 38 or 40, as ſome would fain have it.

I was unwilling to leave off, till I had pitcht upon ſome Hypotheſis that might ſubject the Motion of this Meteor to a *Calculus*, that the Curious might be able to compute the viſible way thereof, either in reſpect of the Horizon, or among the fixt Stars: This I found might be done with tolerable Exactneſs, ſuppoſing that it mov'd in the Arch of a Circle concentrick with the Earth, but 60 Geogr. Miles without it; and that the Point of the firſt Exploſion was over the Lat. of 50° 40′ and 3° 40′ to the Weſt of *London*; and that of the laſt Extinction over Lat. 47°. 40′ with 4°. 50′ *Weſt* Longitude: The Time being fixt to 8 Minutes paſt Eight at *London*. Hence it will be eaſy, by a Trigonometrical Proceſs, to obtain the viſible Altitude and Azimuth of the Meteor at either of its Exploſions, as ſeen from any Place whoſe Longitude and Latitude is known; and from the Time given, the Points in the Sphere of Stars anſwering to thoſe Azimuths and Altitudes are readily deduced. Let thoſe that contend for a much leſs height of this

Meteor try if they can on ſuch their Suppoſition reconcile the ſeveral *Phænomena* before recited with one another, and with the Obſervation of the Reverend Mr. *William Ella*, Rector of *Bampton* in *Nottinghamſhire*, between *Gainsborough* and *Redford*, which for its Exactneſs I muſt not omit. Here at 8h 5′ the Meteor was ſeen to paſs preciſely in the middle between *Sirius* and the Fore-Foot of *Canis major*, moving obliquely to the Southward, in a Line whoſe Direction ſeem'd to be from the middle between the two Shoulders of *Orion*. The Latitude of the place being nearly 53°. 20′, and Longitude *Weſt* from *London* 0°. 45′. Let them try how they can account for its being five Degrees high at *Aberdeen* in *Scotland*, and near as much at *Peterhead* half a Degree more Northerly: and then they will be better able to judge whether it did not exceed the reputed Limits of our Atmoſphere. Laſtly, if the apparent Altitude of the Meteor at *Paris* was not 5½ but 11 *gr.* on the W. by N. Point, when it muſt have been in its greateſt Luſtre, there will be no Pretence to bring it lower than I have made it, eſpecially if it be allowed to have follow'd the Track I have aſſign'd it, over *Preſlain*, *Cardiff*, *Minehead*, *Tiverton*, and *Breſt* in *Bretany*.

Allowing this to have been the Path it mov'd in, it would be eaſy to aſſign the real Magnitude and Velocity of this Meteor, if the ſeveral Accounts of its apparent Diameter, and of the Time of its Paſſage from one of its Exploſions to the other, were conſiſtent with themſelves. But ſome of them making its viſible Appearance nearly equal to the Suns; which in the Opinion of many it far exceeded, we may ſuppoſe with the leaſt, that at the Time when it firſt broke out over *Tiverton*, its Diameter was half a Degree, And its Horizontal Diſtance being 150 Geogr. Miles from *London*, and its Altitude 60, the Hypothenuſal or real Diſtance from the Eye will be more than 160 ſuch Miles; to which Radius the Subtenſe of half a Degree will be above an *Engliſh* Mile and half, being about 2800 Yards *quamproxime*. After the ſame manner it is difficult to aſſign its due Velocity, whilſt ſome make it half, others leſs than a quarter of a Minute, in paſſing from its firſt Exploſion to its laſt Extinction: But the diſtance it moved in that time being about 3 *gr.* or 180 Geogr. Miles, we may modeſtly compute it to have run above 300 ſuch Miles in a Minute; which is a Swiftneſs wholly incredible, and ſuch, that if a heavy Body were projected horizontally with the ſame, it would not deſcend by its Gravity to the Earth, but would rather fly off, and move round its Center in a perpetual Orb, reſembling that of the *Moon*.

Of ſeveral Accidents that were reported to have attended its Paſſage, many were the Effect of pure Fancy; ſuch as the hearing it hiſs as it went along, as if it had been very near at hand: others imagined they felt the Warmth of its Beams; and ſome there were that thought, at leaſt wrote, that they were ſcalded by it. But what is certain, and no way to be diſputed; is the wonderful Noiſe that follow'd its Exploſion. All Accounts from *Devon* and *Cornwal* and the neighbouring

Counties are unanimous, that there was heard there, as it were a Report of a very great Cannon, or rather of a Broadſide, at ſome diſtance, which was ſoon follow'd by a ratling Noiſe, as if many Small-Arms had been promiſcuouſly diſcharged. What was peculiar to this Sound was, that it was attended with an uncommon Tremour of the Air, and every where in thoſe Counties, very ſenſibly ſhook the Glaſs-Windows and Doors in the Houſes, and according to ſome, even the Houſes themſelves, beyond the uſual Effect of Cannon, though near; and Mr. *Cruwys* at *Tiverton*, on this Occaſion, loſt a Looking-Glaſs, that being looſe in its Frame, fell out on the Shock, and was broken. Nor do we yet know the Extent of this prodigious Sound, which was heard, againſt the then Eaſterly Wind, in the Neighbourhood of *London*, as I am inform'd; and by the Learned Dr. *Tabor*, who diſtinctly heard it beyond *Lewis* in *Suſſex*: So that I cannot help thinking, that ſuch a Meteor as this might have occaſion'd that famous Ode of *Horace*: *Parcus Deorum cultor*, &c.

-------- *Namque Dieſpiter,*
Igne coruſco nubila dividens
Plerumque, per purum tonantes
Egit equos volucremque currum,
Quo bruta tellus, &c. *Concutitur.*-----

But whether the Report heard near *Lewis* were of that Exploſion right over *Devonſhire*, or rather of that latter, and much greater at the Extinction over *Britany*, I ſhall not undertake to determine, till we have ſome further Accounts from *France*, whence hitherto we have only had, that at *Paris* the Time of the Appearance was at 17 Minutes paſt Eight.

It remains to attempt ſomething towards a Solution of the uncommon *Phænomena* of this Meteor; and by comparing them with things more familiar to us, to ſhew at leaſt how they might poſſibly be effected. And firſt the unuſual and continu'd Heats of the laſt Summer in theſe Parts of the World, may well be ſuppos'd to have excited an extraordinary Quantity of Vapour of all ſorts; of which the aqueous and moſt others, ſoon condens'd by Cold, and wanting a certain Degree of Specifick Gravity in the Air to buoy them up, aſcend but to a ſmall Height, and are quickly returned in Rain, Dews, *&c.* whereas the inflammable ſulphureous Vapours, by an innate Levity, have a ſort of *Vis centrifuga*, and not only have no need of the Air to ſupport them, but being agitated by Heat, will aſcend in *Vacuo Boileano*, and ſublime to the top of the Receiver, when moſt other Fumes fall inſtantly down, and lie like Water at the bottom; the Experiment whereof was firſt ſhewn me by the Reverend Mr. *Whiteſide* at *Oxford*, and was very lately made before the *Royal Society*. By this we may comprehend how the matter of the Meteor might have been raiſed from a large Tract of the Earth's Surface, and aſcend far above the reputed Limits of the

Atmoſphere; where, being diſengaged from all other Particles, by that principle of Nature that congregates *Homogenia*, viſible in ſo many Inſtances, its Atoms might in length of time coaleſce and run together, as we ſee Salts ſhoot in Water; and gradually contracting themſelves into a narrow Compaſs, might lie like a Train of Gunpowder in the *Ether*, till catching fire by ſome internal Ferment, as we find the Damps in Mines frequently do, the Flame would be communicated to its continued parts, and ſo run on like a Train fir'd.

This may explain how it came to move with ſo unconceivable a Velocity; for if a continu'd Train of Powder were no bigger than a Barrel, it is not eaſy to ſay how very faſt the Fire would fly alongſt it; much leſs can we imagine the Rapidity of the Accenſion of theſe more inflammable Vapours, lying in a Train of ſo vaſt a Thickneſs. If this were the Caſe, as it is highly probable, it was not a Globe of Fire that ran along, but a ſucceſſive kindling of new Matter: and as ſome parts the Earth might emit theſe Vapours more copiouſly than others, this Train might, in ſome parts thereof, be much denſer and bigger than in others, which might occaſion ſeveral ſmaller Exploſions, as the Fire ran along it, beſides the great ones which were like the blowing up of Magazines. Thus we may account for the rattling Noiſe like Small-Arms, heard after the great Bounce on the Exploſion over *Tiverton*; the Continuance of which for ſome time, argues that the Sound thereof came from Diſtances that encreaſed.

What may be ſaid to the Propagation of the Sound through a *Medium*, according to the receiv'd Theory of the Air above 300000 times rarer than what we breath, and as I ſaid before, next to a *Vacuum*, I muſt confeſs I know not. Hitherto we have concluded the Air to be the Vehicle of Sound; and in our artificial *Vacuum* we find it greatly diminiſhed: but we have this only Inſtance of the Effect of an Exploſion of a Mile or two Diameter, the Immenſity of which may perhaps compenſate the extream Fineneſs of the *Medium*.

Of nocturnal Exhalations in the Indies, *by* Fa. Bourzes, n. 337. p. 235.

XXXI. Exhalations in the Night make a Tract of Light in the *Indies* much larger than in *Europe*. I have ſeen 2 or 3 that I ſhould have taken for real Rockets: They appear'd near the Earth, and caſt a Light like that of the Moon, ſome Days after her Change. They fall ſlowly, and in falling make a Curve Line; eſpecially one which I ſaw on the Main-Ocean, at a great Diſtance off at Sea, on the Coaſt of *Malabar*.

A Fiery Meteor in Jamaica, *with ſome Phyſical Remarks on that Iſland, by* Mr. Barham, n. 357. p. 827.

XXXII. About 1700, as I was riding one Morning from my Habitation, ſituated about three Miles North-Weſt from St. *Jago de la Vega*: I ſaw a Ball of Fire, appearing to me of the Bigneſs of a Bomb, ſwiftly falling down with a great Blaze. As I thought, it fell into the Town, but when I came within a quarter of a Mile of the Town, I ſaw many People gather'd together a little to the Southward in the *Savanna*, to whom I rode up, where they were admiring at the Ground's being ſtrangely broke and plough'd in by a Ball of Fire, which, as they ſaid, fell down there. I obſerved many Holes in the Ground, one in the middle, of the Bigneſs of a Man's Skull, and five or ſix ſmaller Holes round about it, of the Bigneſs of a Man's Fiſt, and ſo deep (eſpecially the biggeſt) as not to be fathom'd by what long Switches or Sticks they had at hand. I did not hear that any was ſo curious as to make any farther Search: It was obſerv'd, that the green Graſs was perfectly burnt near the Holes, and a ſtrong Smell of Sulphur remain'd thereabouts for a good while after.

Note that we had a terrible rainy Night before, with much Lightning and great Thunder-Claps, which we have very frequently in *Jamaica*, often killing Cattle in the Fields. Mr. *Henry Lord*, who lives at *Dry-River*, had two Sons (big Boys) ſtruck dead with Lightning, in 1716, without any Wounds or Appearance of Hurt found about them. And as theſe Claps are much louder and ſtronger than any I ever heard in *Europe*, ſo are our Showers of Rain, pouring down in a moſt violent manner. We have Lightning all the Year round, but our great Rains are in the Months of *May*, *Auguſt*, and *October*. I knew *May* for two or three Years without Rain, which was lookt upon as a great Wonder; and we paid dear for it in our *Indigo*; for a Caterpillar appear'd and wove a fine Silk about the *Indigo-Plant*, and deſtroy'd it all, hurting nothing elſe. *May* Rains us'd to deſtroy theſe Worms. *Auguſt* and *October* never go out without a Flood, we having then univerſal Rains all over the Iſland, coming from the Sea: For we have often Rains in the Mountains from the Clouds lodging there, when we have none in the Lowlands.

Our Iſland is full of Mines, and if ſearch'd into, I queſtion not but very rich. We are very ſubject to Earthquakes, ſeveral happening every Year, eſpecially after great Rains, which fill up all our great Cracks in the Surface of the Earth: For in very dry Time, we have them ſo very large, deep, and gaping ſo open and wide, that it is dangerous to ride over ſome Parts of the *Savannaes*, for fear a Horſe ſhould get his Legs into them. Our Earthquakes make a Noiſe or Rumbling in the Earth before we feel the Shake; and ſeem to run ſwiftly to the Weſtward.

A Lunar Rain-bow in Derbyſhire, *by Mr.* Thoresby, *n.* 331. *p.* 320.

XXXIII. An ingenious Gent. being about *Chriſtmas* 1710. at *Glapwell-Hall* in *Derbyſhire*, and walking towards *Patterſon Green*, about 8 in the Evening, obſerv'd with great Satisfaction the Bow the Moon had fixt in the Clouds: She had then paſt her Full about 24 Hours: the Evening had been rainy, but the Clouds were now diſpers'd, and the Moon ſhone pretty clear. This *Iris* had all the Colours of the *Iris Solaris* exceeding pleaſant, diſtinct and grateful to look on, only faint, comparatively to thoſe we ſee in the Day; as muſt neceſſarily follow both from the different Beams that cauſe it, and the Diſpoſition of the *Medium*. The Largeneſs of the Arc was not ſo much leſs than that of the

Sun, as the different Dimenſions of their Bodies, and their reſpective Diſtances from the Earth, ſeem to require. But as to its Entireneſs and Beauty of its Colour, 'twas admirable and ſurprizing. It continu'd about 10 Minutes before the Interpoſition of a Cloud hinder'd his further Obſervation.

Of Marine Iris's *by Fa.* Bourzes, *n.* 337. *p.* 235.

XXXIV. The Sea was very much toſt, and the Wind coming off the tops of the Waves, made a kind of Rain, in which the Rays of the Sun painted the Colours of a Rainbow. 'Tis true, the common *Iris* has that advantage over ours, that its Colours are more lively, diſtinct and of longer Extent. In the Marine *Iris*, we could diſtinguiſh only two Colours; a dark yellow on that ſide next the Sun; and a pale Green on the oppoſite ſide: The other Colours were too faint to be diſtinguiſh'd. But theſe *Iris's* are in a greater number; one may ſee 20 or 30 together, they appear at Noon-day, and in a Poſition oppoſite to that of the common Rainbow, that is to ſay, the Curve is turn'd as it were towards the bottom of the Sea.

A Storm of Thunder and Lightning by Mr Thoresby, *n.* 331. *p.* 320.

XXXV. The beginning of *December* 1710. was remarkable in *Yorkſhire*, for ſuch Thunder and Lightnings, as are not common at that time of the Year; particularly the Evening of the 5th Day, and the Morning of that Day Sevennight; when *John Sainor* of *Bramham* Gardner, and two Women, deſigning early for Market, were ſo furiouſly encountred, that the Females took up at the firſt Houſe they came at; but he proceeded on his Journey, tho' the Lightning was ſo ſevere, as he was riding over *Bramham*-Moor, that he thought his Hair had been burnt, and Face ſcorch'd, at one Flaſh; which being more ſevere than the reſt, did actually ſet on Fire the Stick he had in his Hand, as he was ready to depoſe upon Oath. It yet retains part of the Blackneſs, tho' the Man had beat off much of the end of the Rod (little minding it as a Curioſity) by forcing the Horſe forward, to get the ſooner out of the fiery Incaleſcence.

Another in Monmouthſhire, *by Mr.* Lhwyd, *n.* 334. *p.* 469.

XXXVI. We had at *Ponty Pool June* 6. 1697. an extraordinary Shower of Hail; which extended about a Mile, and laſted near half an Hour. It broke down the Stalks of all the Beans and Wheat within that Circumference; and ruin'd as much Glaſs at Major *Hanbury*'s Houſe, as coſt 4 *l.* the repairing. Some of the Hail were 8 Inches about; as to their Figure very irregular: ſeveral of the Hail Stones being compounded as the Major judg'd who ſaw them.

Strange Effects of a Storm of Thunder and Lightning in Ireland, *com. by* Sam. Molyneux, *Eſq; n.* 313. *p.* 36.

XXXVII. When I went to wait upon Mrs. *Cloſe* at her Houſe at *New Forge* in the County of *Down*, about a Fortnight after, to inform my ſelf in all the Particulars of this extraordinary Accident, ſhe then told me, That *Aug.* 9. 1707. was cloſe, hot, and ſultry, little or no Wind ſtirring until towards the Evening; that there was a ſmall

Breeze with ſome mizling Rain, which laſted about an Hour; That as the Air darkned after Sun-ſet, ſhe ſaw ſeveral faint Flaſhes of Lightning, and heard ſome Thunder Claps at a diſtance; that between ten and eleven a Clock both were very violent and terrible, and ſo increaſed and came on more frequent until a little before twelve a Clock; that one Flaſh of Lightning and Clap of Thunder came both at the ſame time louder and more dreadful than all the reſt, which as ſhe thought, ſhook and inflamed the whole Houſe; and being ſenſible at that Inſtant of a violent ſtrong ſulphureous Smell in her Chamber, which ſhe did not perceive before now, and feeling a thick groſs Duſt falling on her Hands and Face, as ſhe lay in Bed, ſhe concluded no leſs than that part of her Houſe was thrown down by the Thunder, or ſet on Fire by the Lightning; that ariſing in this Fright, ſhe called up her Family, and Candles being lighted, ſhe found her Bed-chamber full of Smoak and Duſt, as alſo the Kitchen that was beneath it: The reſt of the Houſe being ſafe, ſhe was not ſollicitous at that time about any other Damage ſhe might have ſuſtained, more than that ſhe obſerved the Looking-glaſs that hung in her Chamber to be broken.

The next Day again, ſhe found upon further Search and Inquiry, That part of the Top or Corniſh of the Chimney, which ſtood without that Gabel-end of the Houſe where her Chamber was, was ſtruck off; that part of the Copeing of the Splay of the Gabel-end it ſelf was broken down, and the Shingles on the Roof adjoyning thereto (to the number of 12 or 16) were raiſed or ruffled, but none ſhatter'd or carry'd away; that part of the Ceiling in her Chamber beneath thoſe Shingles was forced down, and part of the Plaiſter and Pinning Stones of the adjoyning Wall, was alſo broken off and looſened, the whole Breach 16 or 20 Inches broad. That at this place there was left on the Wall a ſmutty Scar or Trace, as if made black by the Smoak of a Candle, which was directed downwards towards another place on the ſame Wall whereon a Breach was alſo made as the former, and of the ſame Dimenſions, part of which was behind the place where the Looking-glaſs did hang; that the Boards on the back of a large hair Trunk full of Table and other Linnen, ſtanding beneath the Looking-Glaſs, were forced in, and ſplinter'd as if by the Blow of a Smith's Sledge: That two parts of three of the Linnen within this Trunk were pierced or cut through, the Cut appearing of a Quadrangular Figure, and between two or three Inches over; that the end of the Trunk was likewiſe forced out, as the Back was drove in; that at about two Foot diſtance from the end of this Trunk (where the Floor and the Side Wall of the Houſe joyn'd) there was a ſmall Breach made in the Plaiſter, where a ſmall Chink or Crevice was to be ſeen between the ſide Board of the Floor and the Wall, and ſo wide as that a Man could thruſt his Fingers down; and that juſt beneath this again in the Kitchin the Ceiling was forced down, and ſome of the Lime or Plaiſter of the Wall broke off; that exactly under this again ſtood a large Tub or Veſſel of Wood incloſed with a Crib made of Brick and Lime, which was broke and ſplinter'd all to pieces, and moſt of the Brick and Lime Work about it forced and ſcattered about the Kitchen. As the Gentlewoman gave me this Account, I went from place to place viewing each Particular; and as I found all was done on or near the Gabel-end of the Houſe, I have endeavour'd to explain this Deſcription by a Draught thereof, wherein the ſeveral Breaches are diſtinguiſhed: And as I conceived all to be effected by ſome irreſiſtible Body, I have alſo by two Parallel Lines traced out its irregular Motion. *Plate 4. Fig. 1.*

The further material Circumſtances are: That the Looking-glaſs was broke with that Violence, that there was not a piece of it to be found of the largeneſs of Half a Crown; that ſeveral pieces of it were ſticking like Hail-ſhot in the Chamber-door (being of Oak) and on the other ſide of the Room: That ſeveral of the Edges and Corners of ſome of the pieces of the broken Glaſs were tinged of a light flame-Colour, as if heated in the Fire: That the Curtains of the Bed were cut in ſeveral pieces, thought to be done by the pieces of Glaſs: That ſeveral pieces of Muſlin and wearing Linnen, left (on going to Bed) by this Gentlewoman and her Daughter on the Hair Trunk, were thrown and ſcatter'd about the Room, no way ſinged or ſcorched; and yet the Hair on the Back of the Trunk, where the Breach was made, was ſing'd; That the uppermoſt part of the Linnen within the Trunk was ſafe and well, and the lowermoſt Parcel, conſiſting of 350 odd Ply of Linnen, pierced through, of which none was any way ſmutted, but the uppermoſt Ply of a Tablecloath that lay above all the reſt. The Gentlewoman told me, there was a yellow Singe or Stain perceivable on ſome part of the other Linnen ſo damaged the next Day; and that the whole Linnen ſmelt ſtrong of Sulphur; but neither this yellow Stain or Smell was perceivable when I was there: That the Glaſs of two Windows in the Bed-Chamber above, and two Windows in the Kitchin beneath, was ſo ſhattered, that there was ſcarce one whole Pane left in any of them; That the Pewter, Braſs, and Iron Furniture in the Kitchin were thrown down, and ſcatter'd about the Kitchin, particularly a large Girdle about 20 Pounds weight, that hung upon an Iron Hook near the Ceiling, was found lying on the Floor; that a Cat was found dead the next Morning in the Kitchin, with its Legs extended as in a going Poſture, in the middle of the Floor, with no other Sign of being hurt, than that the Furr was ſinged a little about the ſetting on of the Tail.

I muſt further remark, That the Wall both above and below a little Window in the ſame Gabel-end was ſo ſhatter'd at the ſame time, that the Light could be ſeen through the Crevices in the Wall; and that upon a large Stone on the outſide of the Wall beneath this Window, was to be ſeen a mark, as if made by the ſtroke of a Smith's Sledge or large Iron Crow, with which a Splinter or piece of the Stone was broken off of ſome Pounds weight. I was further informed, That from the time

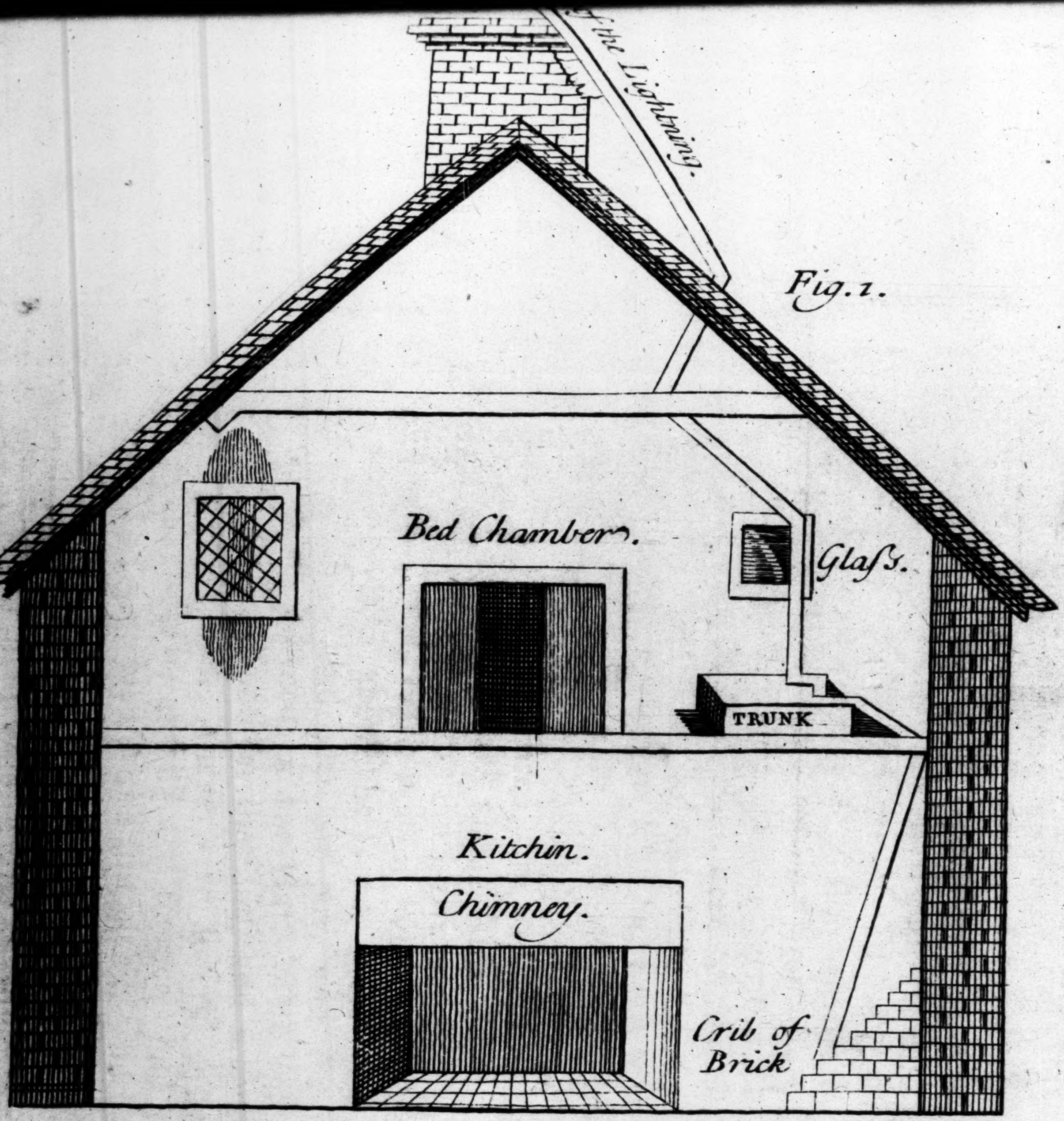


Fig. 1.
of the Lightning.
Bed Chamber.
Glaſs.
TRUNK
Kitchin.
Chimney.
Crib of Brick

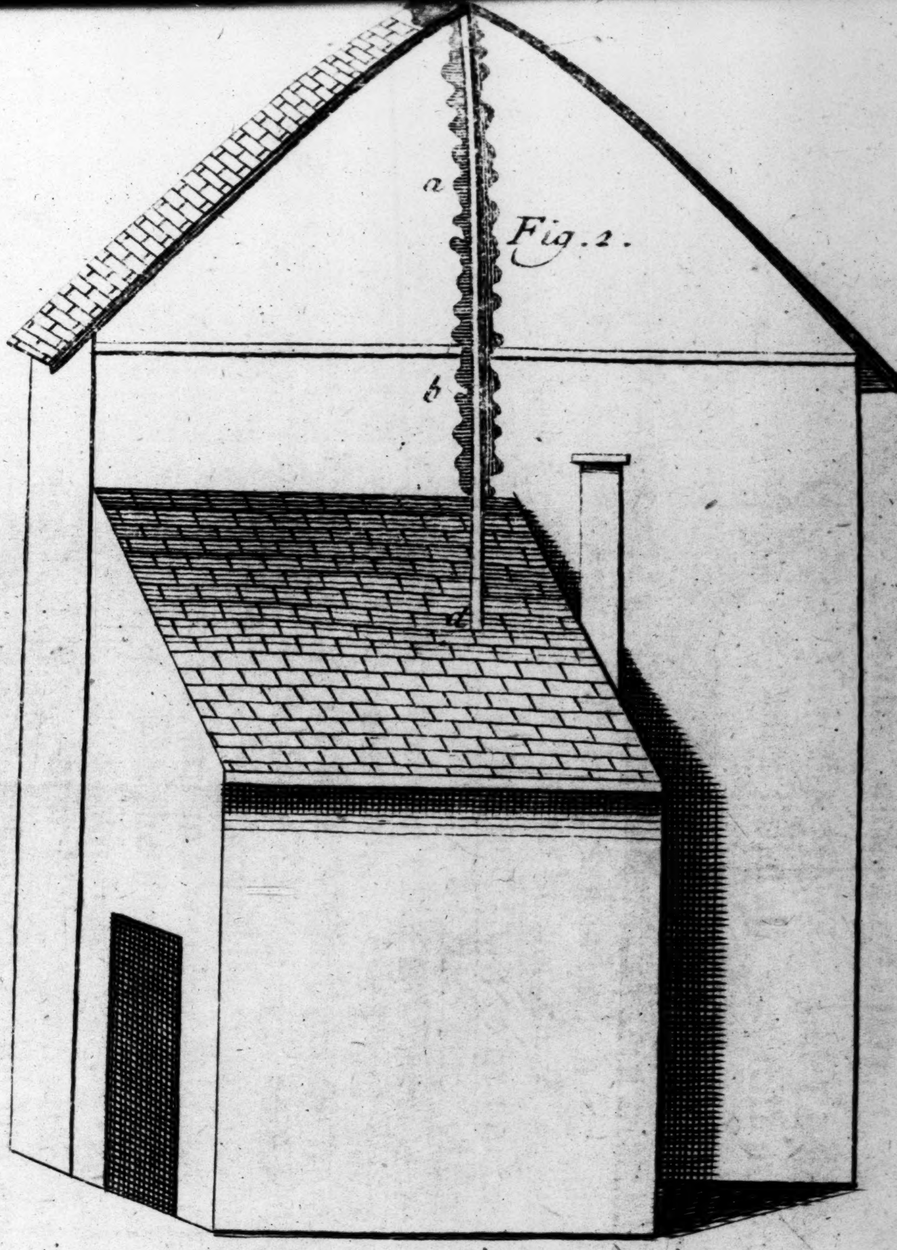


Fig. 2.

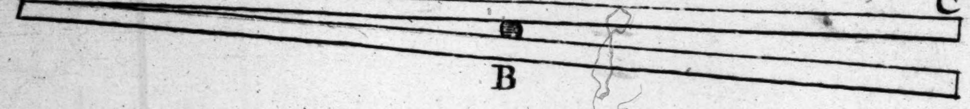


Fig. 4.

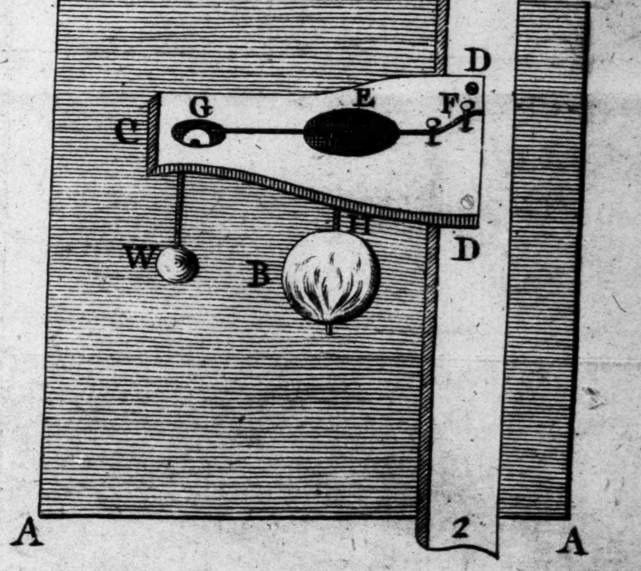


Fig. 3.
A
A
1
D
G
E
F
C
I
D
W
B
H
A
2
A

time of that great Thunder clap, both the Thunder and Lightning diminiſh'd gradually, ſo that in an Hours time all was ſtill and quiet again.

A Storm of Thunder and Lightning by Orlando Bridgman, *Eſq; n.* 316. *p.* 137.

XXXVIII. 1. There happen'd at *Ipſwich*, *July* 16. 1708. a moſt violent Storm of Thunder and Lightning, the Effects of which have been both wonderful and diſmal; it began about Six to be perceived at ſome diſtance, and aroſe in the South Weſt: I happened then to be on the higheſt Eminence about this Town, from whence I could very plainly diſtinguiſh the working of the Storm, and can't but take notice to you of one thing I thought very remarkable, and what I had never met with before; I judg'd it then to be about four Miles diſtance from me: The Inſtant I perceiv'd the Flaſh, it ſeem'd to extend it ſelf like a Bow, and caſt its Light a conſiderable way round it, and the Shaft of Lightning (if I may ſo call it) did not run in a waving Angular Figure as uſual, but in a ſtrait Shaft of Fire, like the Fuze of a Bomb, directly from the Cloud to the Ground; upon which, and finding the Storm approach, I haſtned home, which was not a Mile. Soon after, we had two or three of the greateſt Flaſhes of Lightning; and the noiſe of Thunder that ſucceeded them was ſo very great, and cauſed ſo great an Emotion in the Air, that it made the Rooms ſhake, and the Windows rattle, as in a great Storm of Wind. Dr. *Dade* a Phyſician, and very ingenious Gentleman, aſſured, As he came from his Houſe to me juſt at that time, the Lightning ſeemed to dwell ſome conſiderable ſpace on the Ground, and that he could very plainly feel the heat of it in his Face. The Paſſage-Boat was at that time, coming from *Harwich*, and juſt got to the Town or very near, when came a terrible Flaſh, which killed the Maſter and three Perſons more that were on Board. I ſaw one the next Day that underwent that diſmal Fate, he had a Wound in his Thigh, his Breaſt was lacerated as if he had been whip'd with Wires, and his Face and Body as black as if he had been blown up with Gunpowder, and thouſands of ſmall black Spots about him. The Maſter of the Veſſel was not at all disfigured, but had one Wound of his Side like a freſh Burn, and no other Mark about him, ſave the Chain of his Watch was melted, and no harm nor burn could be perceived on his Breeches or Cloaths. The third Perſon, who was a Servant, was very much torn and ſhatter'd about the Head, the Crown of his Hat was taken clear out, as if it had been cut out, and ſeveral Parcels of his Hair drove into the Subſtance of the Hat. The fourth was very little disfigured, only a black Spot on his Side, and a ſmall Wound, as if made with a Cauteriſing Iron: there were ſeveral others abroad wounded and ſtunn'd. One *Artis*, among the former, had his Hair burnt cloſe to his Head behind, and his Peruke untouch'd; he had a Scratch on his Arm about 4 Inches long, and a ſmall hurt below the Elbow; he fell that Night into a violent Fever, grew delirious, and if not dead yet, is pronounced irrecoverable; whether he received any hurt on his Brain, or the Violence of the Fever cauſes the Delirium, remains undetermined; there was no mark to be ſeen on his Coat, Waſtcoat, or Shirt, where he had his hurt on his Arm. Two of the Perſons killed were on the outſide, and the other two under the Tilt of the Boat; and what is pretty remarkable, the two that were within the Tilt, ſate on each Hand of a Woman that received no Damage: one Perſon had the Sole of his Shooe unripped from the Leather, and no other Damage. There was another Boat that followed them, and received no Damage, and took out the reſt of the poor frighted Wretches; the Maſter of which does affirm, he ſaw the Fire light on the Bowſprit of the former Boat, where meeting a ſmall Reſiſtance, it flew into ſmall Streams like a Rocket, part into the Boat, part into the Water; which if true, no doubt was the cauſe of the Miſchief being done in ſo many different Parts of the Boat, whoever was unfortunate enough to be in the way of thoſe fiery Darts, being the Sufferers.

Its Effects at Colcheſter, *ib. p.* 140.

2. On *July* 16. 1708. *die Veneris* about Eight of the Clock at Night (the greater part of the Afternoon being Cloudy, but more thick toward Night, with Thunder at a diſtance for above an Hour before, and much Lightning) I heard a Thunder-Crack ſo loud, as if it were cloſe to me, (the like I never heard before;) at which time the Thunder and Lightning broke into a Houſe in *Colcheſter*, beginning at the South ſide thereof at the Gable-end, breaking ſeveral Roof-Tiles, and near twenty other, as at *c*, continuing its Courſe Perpendicular, and in a ſtrait Line (the only Motion that ſeems conſiſtent with ſuch Violence, which it ſeems was otherwiſe in the Gentlewoman's † Houſe in *Ireland*) it went into a Lean-to, and lighting on a bunching out of the Wall at *d*, it entered into the Strong-Beer-Buttery through the Laths, and forced a Cork out of the lower Tap-hole of a Butt, to the Loſs of ſome Gallons of Beer; in its way at *a*, it ſhiver'd a Stud about three Inches Square, ſo that one ſide remain'd nail'd to Laths, yet not much thicker than a Lath, and alſo brake it in two as if it were a Tobacco-Pipe. Below the Beam at *b*, it clave or ſplit a Stud, about 4 Inches ſquare, ſeveral Foot down, which is there ſtanding; this was from its violent razing on the outſide. At the time of this Blow Mr. *King* the Maſter of the Houſe was in the Lean-too, and thought he ſhould have been deſtroyed with the Lightning, but received no hurt; he ſmelt a ſtrong ſulphurous Scent. It caſt the broken Wall divers Rood with the Violence. There was ſome little damage done to *Alhallows* Church about the ſame time in the ſaid Town. But that which was moſt lamentable, divers Boats were carrying Perſons from *Harwich* to *Ipſwich* on the *Orwell*; the Violence of the Thunder and Lightning killed four dead immediately, made a Lad run Mad, and wounded the reſt that were in that Boat, which were twelve Perſons, and melted a Watch and the Chain all of a Lump, which was in a Dead Man's Pocket; this was about the ſame time of the aforemention'd.

Plate 4. *Fig* 2.

† *v. ſupr. p* 152.

This was about 18 Miles N. E. of *Colcheſter*, and one Mile S. E. it was no more violent than an ordinary Storm.

A Storm of Thunder and Lightning, by Mr. Thoresby, *n.* 319. *p.* 251.

XXXIX. The more immediate occaſion of this is to acquaint you with ſome of the Effects of a late *Storm of Thunder and Lightning*, and *violent Rain*, which happened *Auguſt* 5. 1708. I was at the *Spaw* at *Harrow-gate* near *Knaresbrough*; where having a ſpacious View upon the open Forreſt, I obſerved the Motion of the Clouds and Storm, which began in the Weſt, wheeling about by the North and Eaſt to the South: When the Night drew on, the Lightning muſt of neceſſity appear more dreadful. The Intermiſſion betwixt the Flaſhes was very ſmall; the Claps of Thunder were ſo very loud, and the Lightning ſometimes ſo continued, that Perſons were generally apprehenſive of ſome Damage, though the more ſurprizing Effect of the Storm was by the Rain, as will appear by the Sequel. But firſt as to the Lightning; It burnt down a Barn near *Scarbrough*: but I ſhall confine my ſelf to thoſe parts where I was, which I have atteſted under the Miniſter's Hand Mr. *Thomas Furnis* of *Bewerly* near *Pately-Bridge*, about ſix Miles from *Ripley*; who writes, That *Thomas Horner*, with others, flying from the Violence of the Rain, which ſeem'd rather to fall in *Spouts* than Drops, took ſhelter in a neighbouring Barn; whence, after ſeveral frightful Thunder-claps, they were expelled by the *Bolt*, as they term'd it, but really the Lightning; which ſinged his Hair, blew another Man backward who was climbing up the Hay-Mow, left a ſulphurous Stench behind it, and in the Concluſion, burnt the Barn and Hay. As to the *Inundation* it was ſurprizing; it tore up much of the Road and Street from the Church to the Bridge, and made Pits in ſome places ſeveral Yards deep, threw down part of a Barn and Stable, both of them lately built, it puſh'd into moſt of the Houſes in the Town; the Water in ſome was as high as the Soles of the Windows, and block'd up the Door of one Houſe with Gravel almoſt to the very top; and if it had continu'd with that Violence half an Hour longer, moſt of the Town had been in the utmoſt danger: Several Perſons were in great danger, but only one Woman drown'd; ſhe was hurry'd away with the Violence of the Stream, and not found till the 4th Day after: It removed the Bole of a large Oak (now ſold for about 4 Nobles) ſeveral Yards; bore down the moſt part of 4 Wood Bridges; and has left at the end of the great Stone Bridge, or within about 100 Yards of it, as much Gravel, &c. as is computed at above a thouſand Cart Loads: One Neighbour gives Ten Pounds for removing the Stones and Gravel left in a ſmall Tract of Ground.

A Storm of Rain at Denbigh *n.* 308. *p.* 2342.

XL. Upon *Tueſday*, the 16th Day of *July* 1706, about eight a Clock in the Morning, it began to rain in and about *Denbigh*, which continued inceſſantly for 30 Hours, but not very violently, till about three or four a Clock in the Morning upon *Wedneſday*, when it rain'd ſomewhat faſter, attended with a terrible noiſe (like Thunder) with ſome Flaſhes of Lightning, and a boiſterous Wind. About break of Day the Rain and Wind began to abate of their Violence, which leſſened gradually every Hour, till about one or two a Clock in the Afternoon, and then it perfectly ceaſed, and the Air became clear and ſomewhat calm. Upon *Tueſday* the Wind blew South Weſt, but on *Wedneſday* it was come to the North Weſt.

The Effects of this great Storm were diſmal, for it occaſioned the overflowing of all the Rivers in *Denbighſhire*, *Flintſhire* and *Merionithſhire*, *&c.* which ſpoiled a great deal of Corn, and took off all the Hay that was mowed, near the Banks of the Rivers, which was carryed by the Stream in ſuch vaſt Quantities down to the Bridges, that it choakt the Arches and Inlets, inſomuch that it broke down above a dozen great Bridges, the rebuilding of which in the three Counties above-mentioned is valued at ſome Thouſands of Pounds. Great Oaks and other large Trees were unrooted and ſwept away, with ſeveral Quickſet Hedges; and ſome Quillets by the ſide of the River *Elwy*, ſo cover'd with Stones and Gravel, that the Owners can't well tell whereabouts their Hedges and Landmarks ſtood; and the ſame River has alter'd its courſe in ſome Places, ſo as to rob the Landlords on one ſide of ſome Acres, and beſtowed as much on the oppoſite ſide. Two or three Rivulets, that convey'd Water to ſome Mills, have been ſo choakt up with Stones and Gravel, that the Owners don't think the Profit will countervail the great Charge of clearing them.

It is affirmed by a great many People, that the great Floods were not ſo much the Effects of the Rain, as the breaking out of an infinite number of Springs, in ſuch Places, as they were never known to flow from before. In the Town of *Denbigh*, a great many broke out in the Houſes and Stables, eſpecially in that part which lies next the Caſtle on the North ſide of it; ſome of which broke out with a great deal of Violence, and in ſuch a quantity, that it is affirmed by ſeveral of the Town, three of theſe new Springs were ſufficient to turn any Corn Mill.

At a ſmall diſtance, Northward of *Denbigh*, lies *Park-Snodiog*, a Rocky Hill, out of which broke out a great many Springs, which flowed ſo plentifully for nine or ten Days, that the Cattel water'd in them for that time; whereas before and after, the People were forc'd to water them all Summer long at a Well in the High-way, at ſome diſtance from this *Park-Snodiog*. There are ſeveral deep Holes and Trenches cut in the High-ways adjoyning to the River *Elwy*, *&c.* ſome ſo very large, as to hide 3 or 4 Horſes, which is not attributed ſo much to the overflowing of the River, as to the breaking out of Springs in thoſe very places.

In *Comb* Mountain there is a Pit of a circular Form, which in the Summer time uſed to have little or no Water in it, and in Winter, as much Water as would ſwell the Surface to about fourteen or ſixteen Yards croſs over: But now in the midſt of Summer it roſe up at leaſt a Yard and a half higher than it was ever known to do in the wetteſt Winters; and overflowing its Banks, it fell down the Hill with ſuch Violence, as to penetrate into the very body of a rocky Road, and dug Pits in it, that will bury the biggeſt Horſes, and the Road which was a common Highway, is now become irreparable.

A Storm of Hail by Mr. Thoresby, *n.* 335. *p.* 514.

XLI. A Storm of Hail, accompanied with very terrible Thunder and Lightning begun *June* 7. 1711. about *Rotheram*, (a little beyond which was ſomewhat of an Hurricane) where it burnt a noted Tree. About one of the Clock it reached *Wentworth-Woodhouſe*. The Hail-Stones were from 3 to 5 Inches in Circumferenee, and ſome ſay larger, which killed ſeveral Pidgeons; but the chief Damage done here, was in the Glaſs Windows, which coſt Forty Pounds in repairing. In *Waſh* Field, about two Miles from thence, it did vaſt Damage. This Field is generally computed to be worth a Thouſand Pounds when in white Corn (to uſe the Countryman's Expreſſion:) Some part of it eſcaped, and the Barley received no Damage; but the generality of the Wheat was cut off, about half a Yard from the Ground, and the Rye about two Foot. The Stubble, though green at firſt, turn'd white, that it look'd like a Field newly Shorn. The Rye was afterwards Mown inſtead of Shearing, and yielded not above a Buſhel of Corn in a Wain-load. Some of the Wheat took Root, and grew up; but the Husbandmen generally thought, that if it ſhould come to Perfection, it would ſcarce yield as much as would be Seed for another Year. The breadth of this Storm was about half a Mile, as appeared by the Effects. In Places adjoyning there was no Hail, but large drops of Rain. A Joiner meaſured one of the Hail-Stones with his Compaſſes, and it was an Inch and half in length: But theſe were not globular, but moſtly oblong. The generality of them there (which was at *Bolton ſuper Dearne*) were of the bigneſs of ordinary Cherries; though the aforeſaid Miniſter's Son took up one that was an Inch and a half in Diameter and round, not long, and ſomewhat flat, as the others were; but the Youth durſt not ſtay long out, the Hail fell with ſuch Violence. Ten of his Pidgeons were brought in ſore wounded, though not quite dead. Great quantities of Twigs and ſmall Boughs were beaten off the Trees, which being of leſs Moment are omitted; but the Damage in the Corn was ſevere upon the poorer ſort of Inhabitants.

A Storm of Thunder and Lightning, com. by John Chamberlayne, *Eſq; n.* 336. *p.* 528.

XLII. In the Pariſh of *Sampford-Courtney* near *Oakhampton* in *Devon*, *Octob.* 7. 1711. about 3 or 4 a Clock in the Afternoon, there was a great Darkneſs as the Miniſter was Catechizing the Children, that he could hardly ſee with Spectacles: And as ſoon as Prayers were over, ſome young Men went to ringing, as commonly they uſed to do; and there were ſeveral People in the Church Porch talking; and of a ſudden, a great Fire-Ball fell in between them, and threw ſome one way, ſome another, but no one was hurted. The Ringers ſaid, they never knew the Bells go ſo heavy in all their Lives, and were forced to leave off: And being very weary, and looking out of the Belfrey into the

Church, ſaw Four Fire-Balls more, a little bigger than a Man's Fiſt, which of a ſudden broke to pieces; ſo that the Church was full of Fire and Smoak. A Man received a full Blow in the Neck, which cauſed him to bleed both at Noſe and Mouth; but is very well now. He ſays, that the Fire and Smoak went up into the Tower, which broke a great Beam which one of the Bells hung on, and the Gudging breaking, the Bell fell on the Floor. It likewiſe carried away one of the Pinacles of the Tower next the Town, and threw ſome of the Stones near a Barn Door at a pretty diſtance from the Church, and hath done ſome Damage to the Barn at one end. The Chimney of the Houſe was remov'd in ſuch a manner by the Thunder and Lightning, that all People admir'd it ſtood, and did not fall upon the Houſe. And though the People ran about in great Conſternation, no body was hurt. This Relation comes from the Miniſter who officiated.

Of the Luminous Qualities of Amber, Diamonds and Gum Lac, by Dr. Wall, *n.* 314. *p.* 69.

XLIII. You may remember my telling you many Years ago, of my good Friend Mr. *Boyle*'s communicating to me, about the Year 1680, his way of making the *Phoſphorus* with Urine, at the ſame time deſiring me to uſe all my Endeavours to find out ſome other Subject, from whence it might be made in greater Quantity; and perhaps he might have made the like Requeſt to many more: for to uſe his own Words, he ſaid, He really pity'd his Chymiſt, who was forced to evaporate ſo prodigious a Quantity of Urine, to get a very little of the *Phoſphorus*. Soon after, in order to ſee ſome Experiments in Chymiſtry, I lodg'd for a ſhort time at his Chymiſt's Houſe, one Mr. *Bilgar*, then living in *Mary le Bone* Street near *Piccadilly*; who indeed was equally, if not more importunate with me than Mr. *Boyle*, to try if I cou'd find out ſome other Matter, from which more might be made than from Urine, telling me there was ſo great a Demand for it, that it wou'd be of very great advantage to him. It being then a very hot Summer, I cauſed a piece of the dry'd Matter in the Fields, where they empty the Houſes of Office, to be digg'd up, in which, when broken in the Dark, a great number of ſmall Particles of *Phoſphorus* appear'd: This Matter I carry'd to Mr *Boyle*, who view'd it with great Satisfaction, and Mr. *Bilgar*, by his Direction, fell to work thereon, but from it cou'd make very little or no *Phoſphorus*, till another Matter was added to it in Diſtillation, and then he cou'd therewith make large Quantities, to his great Profit; for while I was at his Houſe, I often ſaw him make it, and ſell it for ſix Guineas, and ſix *Louis d'Ors* an Ounce, whereby he got ſo much Money, that I believe, he thought himſelf above his Buſineſs, and quickly left *England*.

You well know, *Sir*, that humane Urine and Dung do plentifully abound with an *Oleoſum* and common Salt, ſo that I take the Artificial *Phoſphorus* to be nothing elſe but that Animal *Oleoſum*, coagulated with the Mineral Acid of Spirit of Salt, which *Coagulum* is preſerv'd and not diſſolv'd in Water, but accended by Air.

Conjecturing therefore that *Amber*, which I take to be a Mineral *Oleoſum* coagulated with a Mineral Volatile Acid, might be a natural *Phoſphorus*, I fell to make many Experiments upon it, and at laſt found, that by gently rubbing a well poliſh'd piece of Amber with my Hand in the dark, which was the head of my Cane, it produc'd a Light; whereupon I got a pretty large piece of Amber, which I cauſed to be made long and taper, and drawing it gently through my Hand, being very dry, it afforded a conſiderable Light. I then us'd many Kinds of ſoft Animal Subſtances, and found none did ſo well as that of Wool. And now upon drawing the piece of Amber ſwiftly through the Woollen Cloth, and ſqueezing it pretty hard with my Hand, a prodigious number of little Cracklings were heard, and every one of thoſe produc'd a little flaſh of Light; but when the Amber was drawn gently and ſlightly through the Cloath, it produc'd a Light but no Crackling; but by holding ones Finger at a little diſtance from the Amber, a large Crackling is produced, with a great flaſh of Light ſucceeding it; and, what to me is very ſurprizing, upon its Eruption it ſtrikes the Finger very ſenſibly, whereſoever apply'd, with a puſh or puff like Wind. The Crackling is full as loud as that of Charcoal on Fire; nay, five or ſix Cracklings or more, according to the Quickneſs of placing the Finger, have been produc'd from one ſingle Friction, Light always ſucceeding each of 'em. Now I make no queſtion, but upon uſing a longer and larger piece of Amber, both the Cracklings and Light would be much greater, becauſe I never yet found any Crackling from the Head of my Cane, although 'tis a pretty large one; and it ſeems, in ſome degree, to repreſent Thunder and Lightning; but what to me is more ſtrange than all I have been telling you is, that though upon Friction with Wool in the day time, the Cracklings ſeem to be full as many and as large, yet by all the Tryals I have made, very little Light appears, tho' in the darkeſt Room; and the beſt time of making theſe Experiments, is when the Sun is 18 Degrees below the Horizon; and when the Sun is ſo, though the Moon ſhines never ſo bright, the Light is the ſame as in the darkeſt Room, which makes me chuſe to call it a *Noctiluca*.

As Diamonds are Electral as well as Amber, I have made ſome Trials on them, and think my way of diſtinguiſhing Diamonds morally certain. A Diamond, by an eaſy ſlight Friction in the Dark, with any ſoft animal Subſtance, as the Finger, Woollen, Silk, *&c.* appears in its whole Body to be luminous; nay, if you keep rubbing for a little while, and then expoſe it to the Eye, 'twill remain ſo for ſome little time: But if the Sun be 18 Degrees below the Horizon, if any one holds up a piece of Bays or Flannel ſtretch'd tight between both hands, at ſome diſtance from the Eye, and another rubs the Bays or Flannel with a Diamond ſwiftly and pretty hard on the other ſide of it, the Light to the Eye of him that holds it, ſeems much more pleaſant and perfect than any other way I have yet try'd. But what to me ſeems more ſurprizing than all I have mention'd is, that a Diamond being expos'd to the open Air in view of the Sky, gives almoſt the ſame Light of it ſelf without rubbing, as if rubb'd in a dark Room; and if in the open Air you put your hand or any thing elſe a little over it, to hinder its Communication with the Sky, it gives no Light: And I do aſſure you, I have try'd all or moſt of the other precious Stones, but could find no ſuch *Phænomenon* in any of them; and I muſt further add, that all the Experiments here related were made at the latter end of *May* and beginning of *June*, and therefore I can't pretend to account for the *Phænomena* that may attend Experiments made while the Sun is on the other ſide of the *Æquator*. There are ſome other Bodies that afford Light, and perhaps many more remain yet undiſcover'd, but I'm well aſſur'd, that all or moſt of the Bodies which have an Electricity yield Light; for in my Opinion, 'tis the Light that is in 'em, which is the cauſe of their being Electral, yet this Electricity never ſhows it ſelf without Friction; if you rub any Body that has an Electricity, and apply it near to ſome light Bodies, as particularly very thin Slices of Cork, 'twill put them into a great Agitation, and make them ſeem to the Eye as hanging at the Body by a fine Hair. Jet ſeems to me to be a black Amber, having moſt of the Properties of Amber, but not ſo perfect and pure.

I muſt not forget to ſpeak of another Subſtance, which is alſo a natural *Phoſphorus*, or *Noctiluca*, and that is *Gum Lac*, and alſo red Sealing-Wax, which is made with *Gum Lac* and *Cinabar*, the *Cinabar* no way impeding but rather promoting its luminous Quality, for I caus'd long taper Rolls to be made up of *Lac* alone, and of pure red Sealing Wax, both being well poliſh'd: The Sealing Wax upon Friction ſeems to me to emit its Crackling and Light ſooner than the *Lac*, which I impute to the *Cinabar*'s conſtringing its parts, tho' I think *Lac per ſe* has the greateſt Electricity, both having all or moſt of the Properties of Amber; and by all the Tryals I have hitherto made of *Lac* and Sealing Wax, I find that though the Cracklings are as plentiful in the Day time, as when the Sun is down, yet in the darkeſt Places I cou'd diſcover but a little Appearance of Light, ſo that this deſerves the Name of a *Noctiluca* or *Phoſphorus*, as well as the others already ſpoken of, it being no other than a Vegetable *Oleoſum* coagulated with an Animal Volatile *Acidum*. I don't know in the Animal Kingdom any thing but Piſmires that afford a Volatile Acid, and in the *Eaſt-Indies* there's a large kind of 'em, that live on the Sap of certain Plants, affording both a Gum and a Colour, which Sap paſſing through the Body of thoſe Inſects or Animals, is by their Acid Spirit converted into an Animal Nature; which is the reaſon that with the Colour extracted from *Gum Lac* (which *Gum Lac* is nothing elſe but the Excrements of theſe Inſects or Animals) almoſt as good and full as laſting Colours are made as from

Cochinele: After the ſame manner the remaining Gum, which is an *Oleoſum*, being digeſted and paſſing through the Bodies of thoſe Inſects or Animals, is by their Volatile Acid converted into a Vegetable Animal *Phoſphorus*, or *Noctiluca*; the artificial *Phoſphorus* is a Mineral-Animal *Phoſphorus*, whereas I take the others to be altogether Mineral.

Experiments by Mr. Hauksbee, *of the Time requir'd for the Deſcent of different Bodies of different Magnitudes and Weights. n.* 328. *p* 196.

XLIV. To make theſe Experiments accurately, I deviſed the following *Apparatus*, to account exactly for the time of the Bodies deſcending. At the Height from which the Balls were to be dropt, I fix'd a Contrivance in form of a Trough, in all about 4 Feet long, and the end of it, on which the Balls were laid, was looſe, ſwinging on 2 Pins at the extremity of it. This looſe end was ſupported by a thin piece of Board, which ſlid under it through a Groove from the other part of the Board: To this ſliding Board was fix'd a String, which related to a ſmall Wire that reach'd to the bottom of the Deſcent, where it (the Wire) had a Communication with a Contrivance, to give Motion to a Pendulum which beat $\frac{1}{2}$ Seconds: Now when this ſliding Board (juſt mention'd) was drawn from under that part of the Trough on which the Balls were placed, the String thereby became ſo much ſhorten'd, as to move the Limb of that Contrivance at bottom, which dropt the Pendulum at the ſame inſtant of time, as the Balls began to deſcend.

Exp. 1. The firſt Experiment I made, was with two Balls: One of them a thin Glaſs Buble, fill'd with Quickſilver; its Diameter 8 tenths of an Inch, and its Weight 840 Grains: The other Ball was of Cork, whoſe Diameter was 2 Inches, 2 tenths, and its Weight 120 Grains. When theſe Balls were dropt, the Pendulum made 8 Vibrations, juſt as the Quickſilver Ball ſtruck the Ground, and 8 more were repeated before the Cork arrived at the ſame place. The Pendulum vibrated $\frac{1}{2}$ Seconds preciſely.

Exp. 2. I took a Quickſilver Ball, much of the ſame Weight and Diameter as before: The other was a thin Glaſs Buble, its Weight 493 Grains, its Diameter 4 Inches 3 10ths. For theſe, when they came to deſcend, the Pendulum made juſt ſo many Vibrations as in the laſt Experiment; that is, the Quickſilver Ball ſtruck the Ground at 8 Vibrations, and the other juſt at the end of 16.

Exp. 3. The Quickſilver Ball that I made uſe of in this Experiment, was likewiſe much of the ſame Weight and Diameter as before: The other Ball was of Glaſs, whoſe Weight was 535 Grains; its Diameter one way meaſur'd 5 Inches $\frac{1}{4}$, and its oppoſite Diameter but 5 Inches. Upon the Deſcent of theſe Balls, the Pendulum made but one Vibration more than in the other Experiment; that is, the Quickſilver grounded exactly at 8 Vibrations, and there were 9 more before the other Ball arrived at the ſame place.

Theſe Experiments were made from the top of the Cupola of St. *Paul's* Church, *London*; from whence to the Floor, on which the Balls were dropt, meaſured near 220 Feet. It is to be obſerv'd, that the Quickſilver Balls made no ſenſible Impreſſion on the Floor on which they deſcended (which at that time was covered with Deal Boards) notwithſtanding their Weight and Velocity of Deſcent.

The following Experiments on the Deſcent of Bodies in Air, were there made in the ſame manner.

Quickſilver Balls.			Large thin Glaſs Balls.			
Weight in Gr.	Diam. 10ths of Inch.	Time of falling in ½ Seconds.	Weight. in Gr.	Diam. Inc.	10th.	Time of falling in ½ Second.
908	.8	8	510	5	.1	17
993	.8	8 a little leſs	642	5	.2	16
866	.8	8	599	5	.1	16
747	.7½	8 a little more.	515	5	.0	16½
808	.7½	8	483	5	.0	17
784	.7½	8 a little more.	641	5.	2	16

Theſe Experiments were made *June* the 9th 1710. at which time the Height of the Quickſilver in the Barometer was 29.7 Inches, and the Thermometer 60 Degrees above the freezing Point. The Quickſilver Balls, and the large thin Glaſs Balls, were dropt together as they are ranged in their ſeveral Lines.

——by Dr. Deſaguliers, n. 362. p. 1071.

2. I took 12 Balls (ſix of which were ſolid Leaden Globes of about two Inches Diameter; three hollow Glaſs Balls of about 5 Inches Diameter; and three light Paſtboard hollow Globes of about the ſame Diameter) and having carried them to the upper Gallery in the Lanthorn, on the Dome of St. *Paul*'s Church, I cauſed them to fall down by two at a time, in the following manner;

First, a Leaden Ball and a Glaſs Ball.

Secondly, a Leaden Ball and Glaſs Ball.

Thirdly, a Leaden Ball and a Glaſs Ball.

Then I let fall in the ſame manner the three other Leaden Balls, each with a Paſtboard Ball.

After that, having the Leaden and Paſtboard Balls brought up again, I repeated the Experiment twice more with a Leaden and Paſtboard Ball: then I made the Experiment twice more with a Paſtboard Ball alone, to ſee how long it would be in falling.

Upon the whole it appeared that the Leaden Balls were a very little longer than 4½ Seconds in falling; the two largeſt of the Glaſs Balls 6 Seconds, and the Paſtboard Balls 6½ Seconds.

The height of the Gallery, from whence the Bodies fell, was 272 Foot above the Pavement of the Church (then cover'd with Boards) upon which they fell.

The times of the Falls were taken two ways above, *viz.* with a Wheel-Chronometer, which meaſures a ſmall part of Time accurately, nearer than to a quarter of a Second (made and contriv'd by Mr. *George Graham*, an ingenious Clock-maker) and with an $\frac{1}{2}$ Second Pendulum: And the Differences of Time between the fall of the Leaden Balls and the other Balls were taken below, by the Preſident, *Martin Folkes*, Eſq; *F. R. S.* and another Perſon, who all agreed in their Obſervations of the Time, which they made each with an half Second Pendulum.

The Marks, Weights, and Diameters of the ſeveral Balls.

Leaden Balls	*Troy Weight.* *l.*	*oz.*	*d.*	*Diameters in Inches and Decimals.*
1*c*	2	1	$\frac{1}{2}$	2, 1
2*c*	1	11	4	1, 99
3*c*	1	11	12	2, 0
4*c*	1	11	12	2, 0
5*c*	1	11	12	2, 0
6*c*	1	10	0	1, 98
Paſtboard Balls.				
A	0	3	6	5, 5
B	0	1	14	5, 1
C	0	1	17	5, 1
Glaſs Balls.				
D	0	3	$13\frac{1}{2}$	3, 9
E	0	5	$3\frac{1}{2}$	5, 42
F	0	6	$0\frac{1}{2}$	5, 55

The Polar and Equatorial Diameters of the Glaſs Balls being different, I have ſet down a Mean Diameter for each of them; the true Diameters are thus, of *D* 4 and 3,8. of *E* 5,6 and 5,25. of *F* 5,7 and 5,4. Inches. The particular Experiments are as follows.

Exp. 1. Fall of 1*c* and *D*. *c* fell by the Pendulum in $4\frac{1}{2}''$. The Fall of *D* was ſo near it, that the Difference was not taken either above or below.

Exp. 2. Fall of 2*c* and *E*. 2*c* fell by the Chronometer in 5″, by the Pendulum in $4\frac{1}{2}''$. Time of the Fall of *E* not taken above. The Difference taken below $1\frac{3}{4}''$.

Exp. 3. Fall of 3*c* and *F*. 3*c* fell by Chronometer in $4\frac{1}{2}''$, by Pendulum in $4\frac{1}{2}''$. *F* fell in ſix Seconds. Difference taken below was $1\frac{1}{2}''$.

Exp. 4. Fall of 4*c* and *A*. 4*c* fell by Chronometer in $4\frac{3}{4}$, by Pendulum in $4\frac{1}{2}$. *A* fell in $6\frac{1}{2}$ Seconds. The Difference taken below =2″.

Exp. 5. Fall of 5*c* and *B*. We made no Obſervation above or below.

Exp. 6. Fall of 6*c* and *C*. 6*c* fell by Chronometer in $4\frac{3}{4}''$, by Pendulum in $4\frac{3}{4}''$, C not taken above. Difference below=$2\frac{1}{4}''$.

Exp. 7. Fall 1*c* and *B*. 1*c* fell by Chronometer in $4\frac{3}{4}''$, by Pendulum in $4\frac{3}{4}''$. *B* not taken above. Difference taken below $2\frac{3}{8}''$.

Exp. 8. Fall of 5*c* and *A*. 5*c* fell by Pendulum in $4\frac{3}{4}''$. *A* fell foul, and ſo was not obſerv'd at all. Difference taken below $2''$.

Exp. 9. Fall of *B* alone by the Chronometer in $6\frac{1}{2}''$, by the Pendulum in $6\frac{1}{2}''$.

Exp. 10. Fall of C. alone by the Chronometer in $6\frac{1}{2}''$ by the Pendulum in $6\frac{1}{2}''$.

By *Galileo*'s Theory, the Lead, which was $4\frac{1}{2}''$ in falling, muſt fall 4 Foot the firſt $\frac{1}{2}''$, or 16 Feet the firſt Second, which amounts to 324 Feet in $4\frac{1}{2}''$. But as the Sound of the Ball (as it ſtruck the Bottom) by which we reckon'd our Time, had 272 Feet to move, we muſt abate a $\frac{1}{4}$ of a Second nearly, (ſuppoſing Sound to move one Mile in $4\frac{1}{2}''$) which will take away 35 Feet, that the Body muſt have fallen in the laſt $\frac{1}{4}$ of a Second, and reduce the number of Feet to 289: ſo that the Lead will have only fallen 17 Feet ſhort of the Theory, which muſt be attributed to the Reſiſtance of the Air.

The large Glaſs Ball in the 6 Seconds of its Fall, wou'd in a *Vacuum* go through 576 Feet: but taking away the laſt $\frac{1}{4}$ of a Second or 47 Feet, for Motion of Sound, it muſt only fall 529 Feet in *Vacuo*. Now ſince it fell but 272, there have been 257 Feet taken off from the Fall by the Air's Reſiſtance.

Likewiſe the Paſtboard Ball in $6\frac{1}{2}$ Seconds muſt have fallen 676 Feet: but deducting the laſt quarter of a Second or 51 Feet for the Motion of the Sound, there remains only 625 Feet for its fall in *Vacuo*. But as it fell only 272 Feet, we muſt allow a Retardment of 353 Feet for the Reſiſtance of the Air.

At a mean we may call the weight of the Glaſs Ball 5 *Oz. Troy*, and its Diameter 5 Inches and $\frac{1}{2}$; and the weight of the Paſtboard Ball 2 Ounces *Troy*, and a little more than 5 Inches Diameter.

The Lead Balls all fell within near a Foot of one another, and made an Impreſſion in the Boards of about $\frac{1}{3}$ of their Depth.

The Barometer ſtood at 30,1 Inches, and the Mercury was very Convex, and therefore inclined to riſe ſtill.

Having found by our former Experiments, that thin Glaſs Balls, and even Balls of paſted Paper, were too heavy to make ſo conſiderable a Difference between the time of their Fall, and the Fall of Leaden Balls, that it might be eaſily obſerv'd; I contrived a Way to make dryed Hogs Bladders perfectly round, by blowing them (when moiſt) within a ſtrong ſpherical Box of *Lignum Vitæ*, and letting them dry in the ſaid Box before I took them out: which I did by opening the Box that ſcrew'd in the middle, and had a hole in the Pole of one of its Hemiſpheres to let the Bladder paſs through, in order to tye it after blowing; and ſome few ſmall Holes all over the Box, that in blowing no Air might be confin'd between the inſide of the Box and the Bladder, ſo as to hinder it from putting on a Spherical Figure. Beſides I took off the ends of the *Ureters*, the Fat and a great deal of the upper Coats of the Bladders, before I blowed them in the Box, to render them ſtill lighter.

The Bladders I uſed were ſome of the thinneſt I cou'd find ready blown at a *Druggiſts*, which I moiſtned in Water, taking care to leave none in the inſide. I choſe thoſe rather than green ones, which in drying wou'd have ſtuck ſo faſt to the inſide of the Box, that it wou'd ſcarce have been poſſible to have got them out without tearing.

Having prepared five Bladders in the manner aforeſaid, (which I have deſcribed the more fully to direct any body elſe that ſhou'd be willing to try the like Experiments) I took them up to the upper Gallery in the Lantern on the top of the *Cupola* in St. *Paul's* Church; and there by a Contrivance, which I ſhall juſt now deſcribe, I let them fall by one at a time, together with a Leaden Ball of about 2 Inches Diameter, and weighing 2 *l. Troy*: and I took notice of the time of the Fall of each Bladder, knowing by former Experiments that the Balls are about 4 $\frac{1}{4}$ Seconds, or a little longer time, in falling the ſame Height, which is 272 Feet.

The following Table, conſiſting of five Columns, gives in the firſt, the Marks of the Bladders; in the next their Diameters; in the third their Weights in Grains *Troy*; in the fourth the times of their Fall in Second Minutes of time; and in the fifth, the Difference of Time between the Falls of the Leads and of each Bladder, taken below by the *Preſident*, Dr. *Halley*, Dr. *Jurin*, *Martin Folkes*, Eſq; and Mr. *George Graham* the Clock-maker. The Time was taken above with Mr. *Graham's* Chronometer, (formerly deſcribed); and below with the ſame Inſtrument, and three half Second Pendulums, all which agreed very well together.

The Experiments having been made twice over, the Table is twice ſet down; and thoſe Experiments in which the Bladders fell ſtreight down, and the moſt regularly, have this Mark before them (*).

Marks.	*Diameters in Inches.*	*Weight in Gra. Troy*	*Time of the whole Fall.*	*Diff. between the Lead and Bladder.*
A	5,3	128	$19\frac{3}{8}''$	$14\frac{2}{8}$ Seconds.
* B	5,193	156	$17\frac{1}{4}$	$12\frac{3}{4}$
C	5,33	$137\frac{1}{2}$	$18\frac{3}{4}$	$14\frac{5}{8}$
D	5,26	$97\frac{1}{2}$	$22\frac{1}{8}$	$17\frac{6}{8}$
* E	5,02	$99\frac{1}{8}$	$21\frac{5}{8}$	17
* A			$19''$	$14\frac{1}{2}$
B			$18\frac{5}{8}$	$14\frac{1}{4}$
* C			$18\frac{3}{8}$	14
D			24	$19\frac{1}{8}$
E			$21\frac{1}{4}$	$16\frac{6}{8}$

The Diameters and Weights may be relied upon, being taken the Day that the Experiments were made, and the Day after; but the Diameters and Weights taken 10 Days before not agreeing with theſe, I have left them out. For the Bladders by drying had loſt of their Weight, and altered their Diameters.

As the Necks of the Bladders in drying ſhrink ſo as to open a little, they muſt be blown before each Experiment.

Plate 4. *Fig.* 3. *A, A, A, A,* is the Hole through which the Bodies fell. 1, 2, is a Board laid over the Hole. *G, D, D* is another Board fixt to the firſt Board by the two Wood Screws *D, D,* with a Pulley *G* at the other end of it, over the Hole. *W* is a two Pound Ball of Lead faſtned to a ſtrong Thread, which going over the Pulley is ſtretched horizontally from *G* to the Nails *F*; to which it is faſtned, ſo as to be about a quarter of an Inch above the Board.

B is one of the Bladders, hanging with the Neck or heavieſt part downwards, by means of a Loop of fine Thread as *E H,* which goes over the Horizontal Thread *G E F.* Now when with a pair of Sciſſars the Thread of the Lead (which in all is but one Foot long) is cut juſt at *E,* before the Loop of the Bladder, the Lead pulling away the String, the Loop of the Bladder ſlips off the remaining Thread *F E,* and begins to fall exactly in the ſame Inſtant as the Lead: But if the Thread ſhould be cut between *E* and *F,* as the Lead falls, its Thread might give the Bladder an oblique Direction.

He that obſerves the time either with a Pendulum or Chronometer may take it very exactly, by ſeeing the Motion of the Sciſſars as they cut the Thread.

As the Diameters of the Bladders were taken by wrapping a Thread twice round them, and ſomething muſt be allowed for the Thickneſs of the Thread; I have here under ſet down the Diameters of the Bladders, as corrected by that Allowance. *viz.* *A* 5,28 Inches; *B* 5,19; *C* 5,30; *D* $5\frac{1}{4}$; and *E* juſt 5 Inches in Diameter.

The Bladder *E* was rough, with ſeveral Wrinkles and Inequalities, which made it be longer in falling than it ought to have been, according to its Diameter and Weight.

A Pail of Water thrown down, met with ſuch a Reſiſtance in falling 272 Foot through the Air, that it was all turn'd into Drops like Rain.

Of the Effects of Air paſt through red hot Metals, and other hot Media, by Mr. Hauksbee, *n* 328. *p.* 199.

XLV. In order to find what Effect ſuch a *Medium* as Air paſſed thro' red hot Metals, might have on the Lives of Animals, I contrived the following Method. I took a large Receiver open at top, in Diameter about 4 Inches, which was covered with a braſs Plate and wet Leather, as uſual in Glaſſes of ſuch a make. To this Plate at top (which had a Screw with a ſmall Perforation) belonged a Cock, and from that Cock proceeded a ſmall hollow Wire, about 3 Feet in length: That End of this hollow Wire, which was remote from the Receiver, was put into a hollow piece of Caſt Braſs, pretty thick in Subſtance, but the Hole was not quite through: And the Hole being larger than the ſmall hollow Wire, it was wedg'd into the ſame with pieces of Steel Wire, till the Caſt Braſs was fill'd as full as it could contain. In this manner it was put into a Charcoal Fire, and there it lay till it was throughly red hot. The Receiver being then exhauſted of its Air, the Cock on the upper part of it was turn'd, which gave liberty for that Air only, which of neceſſity muſt paſs through the red hot Metals, to ſucceed. This Air firſt paſſing down through the ſmall Ducts between the red hot Wires, before it could come to enter the red hot hollow braſs Wire, muſt of neceſſity ſuffer or undergo ſuch a Change, as Fire or the Fumes of ſuch red hot Metals would give it. When the Receiver was fill'd with this Air, and had ſtood ſome little time, the braſs Cover was taken off, and a pretty large Cat immediately plung'd into it: The Cover being laid on again, the Cat immediately fell into Convulſions, and in leſs than a Minute appeared without any ſign of Life. Then being taken out of the Receiver and laid on the Floor, ſhe continued as Dead; but in leſs than a Minute of time ſhe began to diſcover Life by Motion in her Eyes, and after 2 or 3 hideous Squalls, ſhe began to recover apace; but was very fierce, and did ſpit and fly, (as well as her Weakneſs would ſuffer her) at any one that offer'd to touch her; and it ſeem'd hazardous for any one then to attempt it. But after half an Hours time, or thereabouts, as her Strength and Eaſe recovered, ſo her former Temper encreaſed upon her, ſuffering herſelf to be handled without any ſign of Fierceneſs, as before.

As to the Effect, which the ſame ſort of factitious Air has upon flame, take as follows.

I no ſooner came to plunge a lighted Candle into it, but it was immediately extinguiſh'd: And this I ſeveral times obſerv'd, that when the Candle was ſlowly immers'd, ſo much of the Wick (which before was lighted) as came but within the verge of the Glaſs, died; and ſo the reſt ſucceſſively, as it deſcended to the ſame place: And this upon ſeveral Repetitions, anſwer'd much the ſame: But in ſome time, as the common Air came to mix with it, one might plunge the lighted Candle lower and lower, before it did go out, till at laſt it would remain burning at bottom.

As to the Elaſticity and Specifick Gravity of the forementioned *Medium*, I have made ſeveral Tryals, (and I think very accurate,) but find it no ways differing from Common Air, in reſpect to thoſe Properties. Hence it follows,

That the foregoing Effect is no ways aſſiſted from any Imperfection or defect in the laſt mentioned Properties: Therefore the following Queries ſeem to offer themſelves. 1. Whether Air it ſelf may ſo ſuffer in its own Nature by any ſort of Fire, as to be diveſted of the Power of ſubſiſting Life or Flame: Or, 2. Whether the *Effluvia*, or Steams, proceeding from the red hot Metals, which the Air may take along with it in its Paſſage near them, do not very much contribute, if not wholly occaſion the Effect.

If the latter takes place, I preſume it may in ſome meaſure be applied to account for the Effect, that the Damps, or Steams, which ariſe from Subterraneous Caverns, impregnated with Metalline *Effluvia*, have on the Lives of Animals: And yet at the ſame time, the ſame Air may ſuffer no Change in reſpect to its other Properties, I mean its Elaſticity and ſpecifick Gravity, in Compariſon with other Air in the ſame Region.

Ib. p. 201. 2. I contriv'd a braſs Box, about four Inches long, and an Inch and a half over: At one end, which I ſoder'd up, I fix'd two ſmall braſs Tubes; one of which went through, and reach'd the remoter end nearly; the other Tube was but juſt inſerted in it, but each of them long enough to reach ſufficiently above the Surface of the Water in which they were to be put. Theſe Tubes were to convey the Air into a Receiver exhauſted of its Air: It paſs'd firſt into that Tube which nearly reach'd its oppoſite end, and ſo into the other which led to the exhauſted Receiver. But the Box, with that part of the Tube that was within it, was firſt preſſed full of braſs Duſt; which I had the conveniency to do by means of a braſs Cap, which ſcrew'd on to the end, not before mention'd. This braſs Duſt I moiſtned with a little Water, thinking thereby to exert a more than ordinary Steam, or *Effluvia*, from the Metal, which the Air might take along with it, as it paſs'd through ſuch ſtrait and narrow Avenues, as it muſt do between the braſs Duſt. In this manner it was put into the Water when Cold, and continued in it till it had boil'd a conſiderable time; by which means it muſt, in all its Parts, be of the ſame Degree of Heat (at leaſt) as the boiling Water. Thus it was taken out, and applied to the exhauſted Receiver; where, upon turning a Cock, I gave liberty for that Air only to paſs into it, which muſt ſucceed through the braſs Box and Duſt, under the Circumſtances before mentioned. When the Receiver was full of this Air, the Cover was taken off, and a lighted Candle plung'd into it, where it continued burning, even at the bottom, as if it had paſs'd through no ſuch *Medium*, but had been full of common Air. I took that Method to try it, believing the flame of a Candle to be the moſt tender way of diſcovering a Change in Air. Afterwards I repeated the ſame Experiment over again, with dry braſs Duſt inſtead of the former; but the Succeſs was the ſame. Therefore it ſeems to me, that ſuch a Degree of Heat, as that of boiling Water, is not ſufficient to cauſe any conſiderable Change (if any at all) in the Air; nor ſuch a Degree of Heat, able to ſtrike any injurious, or ſuffocating *Effluvia*, out of the Metalline Particles.

The paſſing of Air through a red hot Glaſs Tube into an exhauſted Receiver, had no manner of influence on a Sparrow put into the ſame: But upon paſſing of Air through red hot Charcoal, before it enter'd the Tube that convey'd it into the exhauſted Receiver, the fore-mention'd Animal, in that *Medium* in about a quarter of a Minute, gave Signs of preſently expiring; but being taken out at the ſame time did recover, and continued living and well for ſome Days after. Yet it was concluded, had the Birds Continuance in the Receiver been but double that time, her recovery would have been very doubtful. I have likewiſe try'd Air paſs'd through the Flames of Spirit of Wine, and Oil of Turpentine: The Effect was much the ſame as to the Spirit of Wine, the Flame of a Candle being immediately extinguiſh'd upon its being plung'd into it: But the Air which paſs'd through the Flame of the Oil of Turpentine took ſome unctuous Fumes along with it into the exhauſted Receiver; which Fumes, upon the near approach of a lighted Candle, ſuddenly took fire, and continued to burn on the upper Surface, till they were ſtifled by covering cloſe the Receiver: And upon ſeveral Repetitions it anſwer'd much the ſame, till the whole quantity of Fume was conſum'd.

A Deſcription of the Apparatus for making Experiments on the Refractions of Fluids, ib. p. 204.

XLVI. The whole *Apparatus* is fix'd on a Table, parallel to its Surface. On one and the ſame *Axis* is fix'd a Sextant, of a *Radius* of 4 Feet, and a moving Limb to bear the Object. The Sextant is divided into Degrees and Minutes by a Diagonal, and remains always fixt. The Object, which is plac'd on the moving Limb, is ſeen parallel with the Table when obſerv'd through the Priſm, and at no Degrees on the Sextant; but when any tranſparent Liquid is put into the ſame, the Object muſt be elevated till it appears to the Eye: Then obſerving how many degrees and Minutes the *Index* on the Limb cuts on the Sextant, we note it, and call it the Angle of Obſervation. Thus for different Liquids you have different Elevations of the Object, as you will find by the following Table. The Sight-Slit (if I may call it ſo) is compos'd of two pieces of box Wood, plan'd parallel to one another: Theſe Pieces are ſeparated only by 3 ſlender Slips of common Cards; and with that Intervention are ſcrew'd down one upon the other, exactly parallel with the *Axis* of the moving Leg and Sextant. The Priſm, through which it directs the Sight, is plac'd pretty near it, and conſiſts of an Angle of 44°. 54', which Angle is fix'd Perpendicular to the Plane of the Table, its upper ſide being parallel with the ſame. The Object is a piece of white Paper, in form of a Croſs, paſted on a black Board, and is fix'd, at the end of the moving Limb, which is in length about 7 Feet from the Sight; its Diameter is about 2 ½ Inches, which juſt comprehends the Sight through the Slit; ſo that when the Object is wholly within view, we conclude the Obſervation to be exact. With this *Apparatus* the Experiments are made as well by Candle-light as Day-light, (the Preſence of the Sun Beams being no ways neceſſary) and I think they may be depended on as pretty accurate. I have taken the Specifick Gravity of the ſeveral Liquids, where I could obtain a ſufficient quantity, as appears by the Table: So that if any Perſon ſhould have the Curioſity to repeat theſe Experiments, he muſt expect a different Angle of Obſervation, if the Specifick Gravity agree not with the Table; for ſometimes it happens, that Liquids of the ſame Denomination are not always of an equal Goodneſs, and conſequently will have a different Specifick Gravity and Refraction.

The Chriſtalline Humour of the Ox Eye I preſt into the Angle of the Priſm, whereby it received the form of it, and gave the Angle of Obſervation, as ſpecify'd in the Table. I could not ſee the common Object through it, but was forc'd to make uſe of a Candle for that purpoſe; the Flame whereof appeared very broad, at leaſt 5 or 6 Inches, nearly in the form of a Half-Moon: But what ſhould occaſion ſuch a Change of figure, I cannot at preſent determine. Of all the Fluids I have try'd, I find nothing to refract a Ray of Light leſs than Water; yet there are ſeveral other Liquids which make the ſame Angle. I obſerve Oil of Bees-Wax to be the lighteſt Fluid, and Butter of Antimony *per Deliquium* to be much the heavieſt: The difference of Specifick Gravity between theſe two Bodies, is as 662 is to 1976, that is, nearly as one to three: And the Ratio of their Refractions but as 10000 is to 6885 Bees-Wax, ſo is 5941 Antimony to the ſame *Radius*; that is, as one to 1.16, or thereabouts. Likewiſe Oil of Vitriol is in Specifick Gravity to Oil of Saſſafras, as 1510 is to 898; yet the *Ratio* of Refraction of the lighteſt is moſt conſiderable, being in proportion as 10000 is to 6475 Saſafras; ſo is the ſame *Radius* to 7011 Vitriol. Thus I find, that a Body doth not Refract in proportion to its Specifick Gravity, but from ſome quality peculiar to its ſelf.

The Specifick Gravities, &c. of ſeveral Fluids.

Specifick Gravities in Compariſon with a bulk of Water equal to 820 Grains.		Angle of Obſervation. *d. l.*	Ratio of Refraction, as 10000 is to
		16.50	7485.3
Oil of *Saſſafras*	898	29.20	6475.8
Turpentine	713.5	25.25	6741.8
Bees-Wax	662	23.30	6885.4
Carawayes	752	26.13	6696.5
Oranges	711	25.20	6741.2
Hyſſop	769.5	25.10	6757.6
Roſemary	747	24.40	6794.7
Savin	789	25.30	6730.9
Origanum	752	25.00	6770.2
Pennyroyal	783	25.30	6730.9
Mint	780.5	26.00	6706.4
Spike	749	24.30	6807.3
Fennel	798	27.10	6616.5
Juniper	729	25.10	6757.6
Cummin	766.5	27.00	6627.7
Tanſey	757	23.46	6865.1
Dill	795.5	27.40	6582.7

Oil of *Amber*	733	26.30	6662.3
Cinnamon	828	28.40	6517.7
Cloves	827	27.20	6606.8
Nutmegs	759	25.40	6721.4
Spirit of *Wine*	703.5	18.50	7287.9
Hartſhorn	786	17.00	7468.3
Vinegar	824.5	17.00	*As Hartſhorn.*
Sal Armoniack	794.5	16.56	7475.2
Acids, Spirit of *Amber*	825	16.56	*As Sal Armoniack.*
Oil of *Vitriol*	1510	21.56	7011.5
Spirit of *Nitre*	1166	20.50	7104.
Aqua Regis	987	19.50	7195.
Aqua Fortis	1157	20.40	7120.5
Aqua Regis from *Aqua Fortis* and *Sal Armoniac.*	1034	20.10	7161.5
Butter of *Antimony*	1976	40.00	5941.3
Spirit of *Raw Silk*	916	20.30	7135.
Spirit of *Honey*	716	16.50	*As Water.*
Tinct. of *Antimony*	693	18.46	7294.3
Jeſuits Bark	720	18.46	*As Tinct. of Antimony*
Balſ. Tolu	717	19.34	7219.3
Gum Amoniacum	719	19.10	7257.3
Mettals.	713	18.54	7281.7
Vitreous Humor of an Oxes Eye		16.50	*As Water.*
Chriſtalline Humor of the Ox Eye		24.10	6832.7
White of an Hens Egg.		17.40	7401.3
Jelly of Hartſhorn		17.50	7384.7
Human Saliva		16.50	*As Water.*
Human Urin		17.05	7451.9
French Brandy		18.20	73386

Oil of Turpentine ſtrongly ting'd Green, with filings of Braſs, no ways alters its Refraction.

XLVII. The Experiment related by the late Dr. *Hooke*, in one of his Papers (delivered to me by Mr. *Waller*) is concerning two Liquors, which, when mixt together, would poſſeſs leſs ſpace than when ſeparate; which he calls a Penetration of Dimenſions: And adds further, That this Penetration is the cauſe of Heat, of Fire, of Flame, of the Power of Heat, Fire, and Gun-powder, and ſeveral other *Phænomena*, which ſeem to be moſt prodigious and wonderful in Nature. And ſince the Experiment ſeem'd ſo conſiderable, as to account for ſeveral ſurprizing Operations in Nature, I thought it very worthy an Examination, by a Repetition of the ſame.

Of two Liquors, which, mixt poſſeſs leſs ſpace, than ſeparate, n. 331. p. 325

Accordingly I procured a Bolt-head (ſuch as he there deſcribes) with a long ſmall Stem, which I fill'd nearly full of common Water. The Stem was mark'd into ſeveral Diviſions, on a piece of Paper paſted along it; by which means, I diligently obſerv'd the height of the Surface of the Water. Then pouring as much of it out as fill'd a certain Meaſure, which being thrown away, I fill'd the ſame Meaſure, as nicely as poſſible, to the ſame height, with ſtrong Oil of Vitriol; which I return'd into the Bolt-head, in the room of ſo much Water taken from thence: Upon the mixing of theſe Liquors enſued a pretty ſtrong Ebullition; and abundance of airy Particles were viſibly extricated, and the Surface was not ſo high in the Stem conſiderably, as when it was poſſeſt only by Water. But here I muſt take notice, that two or three drops of Oil of Vitriol were accidentally ſpilt, in putting it into the Bolt-head; but yet the Experiment was very manifeſt, in the gradual decreaſe of the Dimenſions of the Liquors. And 'tis to be obſerv'd, that although they became very warm, yet contrary to the Nature of moſt Liquors in ſuch a State, they continued to poſſeſs leſs and leſs ſpace; which was viſible by the ſinking of the Surface in the Stem of the Bolt-head; and in about half an Hours time, it had deſcended above an Inch: And when I viſited it on the *Monday* following (for the Experiment was made on the *Thurſday*) I found it had ſubſided at leaſt two Inches below the mark I had left it at. Now whether the Ebullition produced by the Heat, might not evaporate that quantity, which it ſeem'd to loſe in ſpace; or whether, in ſo many Hours time, as it had been ſince the Experiment was made, there might not be ſuch an Evaporation of the parts of the Fluid, as to become equal in bulk to the quantity of the diſpoſſeſs'd ſpace; and whether it was ſo or not, I gave my ſelf Satisfaction after the following manner. Into an upright Glaſs that would hold about 3 Ounces of Water, I put a quantity of the ſame Fluid equal to 885 Grains: Into another Glaſs of the ſame Form, but ſmaller, I put a quantity of Oil of Vitriol equal to 456 Grains, which, with their reſpective Glaſſes, I weigh'd all together in a nice Ballance: After which, I put the Oil of Vitriol, Glaſs and all, into that which held the Water; where immediately a very great Ebullition began, and the Glaſs that contained them became ſo hot, as to be but juſt endured in the Hand. I found in two Minutes time it had loſt of its Weight about two Grains: And at the end of an Hour, or better, it had decreaſed in all but 6 Grains and a half; by that time the Conflict was wholly ceaſ'd, it being then nearly reduced to the Temperature of the outward Air. After that, I weigh'd them at ſeveral Times, but found them in the ſame State, as to their Weight, as laſt mentioned. I continued them in the Scale till the next Morning, when I likewiſe could diſtinguiſh no manner of Alteration in the fore-mentioned Weight. From whence it plainly appears, that the decreaſe of bulk upon the mixing of theſe Liquors, does not proceed wholly from an Evaporation of their Parts; ſince by the laſt Experiment,

ment, the Evaporation continued no longer than the Fermentation laſted, but the decreaſe of the bulk of the Bodies, ſeems not to be performed all at once, or in ſo ſhort a time, as may be taken notice of in the firſt Experiment.

An Endeavour to produce Light through a Metallick Body, under the Circumſtances of a Vacuum *and Attrition. ib. p.* 328.

XLVIII. The Succeſs I had in producing Light through Bodies, ſuch as Sealing-Wax, Pitch, and common Sulphur; gave me ſome Probability, that under the ſame Circumſtances I might likewiſe make ſome ſuch Diſcovery through a Metallick Body. Accordingly I cauſed a Glaſs-Hemiſphere to be made very ſtrong: To this Hemiſphere I procured another, of Burniſh Braſs, exactly made, to fall with its Brim about an Inch within the Glaſs, that I might the better cement them together; which I did ſecurely from any ingreſs of the Air in that part. Thus, when joined, it became nearly a Globe; only the Diameter through its *Axis*, was ſomewhat more than its tranſverſe Diameter, which was a diſadvantage to its Strength, as the Sequel of this Relation will diſcover. In this manner I exhauſted all its Air, as leaſt nearly ſo, and then put it on the Machine to give it a circular Motion, as uſual in ſuch Experiments. I applyed my Hand to the braſs Hemiſphere in Motion, but no Light could be diſcover'd within: I then rubb'd it with a Deal Stick, but the Succeſs was the ſame. Afterwards I applied a piece of Sealing Wax, which has in itſelf a very Electrical Quality: This Wax, rubbing roughly on the Braſs, ſeem'd to ſhake the Parts of it; nevertheleſs there did not any the leaſt glimpſe of Light appear. I then held the Flame of a Candle to the Braſs in Motion, which ſomething more than warm'd a Circle on it; hoping by this means, to excite or obtain ſome Diſcovery from it. Yet, notwithſtanding a ſmart Attrition was made on that part, it was altogether unſucceſsful. Being tir'd, I let in the Air, and ſuſpended my farther Tryals till the following Night. At which time, when I had exhauſted the Air from within the Globe, I began the Attrition with a Coal Cinder; which being ſomewhat rough, I thought it might ſhake the Parts of the Mettal, and put them into ſuch a State or Mode, as to exhibit an Appearance of Light: But this, and whatever elſe I then did try, was to no purpoſe. In this exhauſted State I left the Globe on the Engine, to conſider a little what farther Tryals to make; with what Bodies, and in what manner to proceed with them: But to my great Surprize, in about an Hour after (being in the next Room) I heard a Noiſe almoſt as loud as a Musket when fir'd; and I immediately coming into the Room, found the Globe broken all to pieces (I mean the Glaſs half of it) and the Hemiſphere on the Ground; which I took up, and found ſeveral Bruiſes it had received from the violent ſtrokes of the broken Glaſs, which had diſperſed it ſelf in pieces all over the Room. A large Looking-Glaſs, at leaſt three Yards diſtant from it, was crack'd almoſt from top to bottom, and quite croſs the middle, by a Blow it received from a Fragment of it; for where it ſtruck the Glaſs, the Cracks proceeded from it every way, like ſo many *Radii* drawn from a Center. Thus were the Experiments ended; and as I hinted before, this Accident I believe proceeded from the Unconformableneſs that the Figure of the compounded Globe had to a perfect Sphere, although it did not differ ſo much to ſight, as to make me ſuſpect any ſuch Conſequence. From theſe Experiments I may ſafely conclude, that if there be any ſuch Quality as Light to be excited from a braſs Body, under the fore mentioned Circumſtances, all the Attritions of the ſeveral Bodies uſed for that purpoſe, have been too weak to force it from it. And indeed, conſidering the cloſeneſs of the Parts of Metal, and with what Firmneſs they adhere, entangle, or attract one another, a ſmall degree of Attrition is not ſufficient to put their Parts into ſuch a Motion, as to produce an Electrical Quality; which Quality, under the fore-mentioned Circumſtances, I take to be the Appearance of Light in ſuch a *Medium.*

Of Objects becoming viſible through Pitch in the dark, n. 322. *p.* 391. † *See* Phyſ. Mech. Exp. *p.* 13.

XLIX. 1. This Experiment affords a ſignal Confirmation of another † formerly made, and differs only in the Matter made uſe of. I before uſed Sealing-Wax, but now made choice of Pitch, which I ſerv'd as the Sealing-Wax; that is, I melted it in a Glebe-glaſs, and kept it turning about 'till the larger half had got a pretty thick lining of it; it was even ſo thick that a Ray of Light could no way penetrate it. This Globe I exhauſted of its contained Air; then (being Night) I put it on the Engine to give Motion to it; where, after it had been turned a little while with my Hand on that half lined with the Pitch, I could very eaſily diſcover through the tranſparent part, on the inward Surface of the Pitch, the very ſhape and lines of it, as likewiſe of my Fingers; for the moſt eminent Parts of the Hand and Fingers that toucht the Glaſs, appeared all luminous: The other Parts diſcovered themſelves by the dark Intervals they made between the enlighten'd Parts: And when the Fingers were ſpread or cloſ'd, 'twas very obvious to the Sight. Now after a ſmall quantity of Air was let in, the Light diſappear'd on the inſide of the lined part (but not on the other,) which began to diſcover it ſelf more and more on the outſide; tho' even in Vacuo there was always a Light attended on the touch of thoſe Parts that were moſt contiguous to the Glaſs: But now a Circle of Light would diſcover it ſelf juſt on the edge of the Pitch which ſeparated it from the tranſparent Part, as likewiſe another ring of Light ſomewhat nearer to the Axis of the Glaſs, but both theſe when the Hand was apply'd to the under part; for when it was remov'd to the contrary, no ſuch appearance enſued. The tranſparent half of the Glaſs was in all Circumſtances as in former Experiments. When all the Air was let in, the Electricity of the Glaſs in all its parts, the lin'd as well as the Tranſparent, performed much alike. The Threads ſeem'd to be attracted every where with equal Vigour. To conclude, this and the forementioned Experiment of the Sealing-wax plainly diſcover a tranſparent Quality in ſome Bodies (we call Opake) under ſuch and ſuch Circumſtances:

ſtances: Bodies which are really Opake, have hitherto been thought to continue always ſo. It was never ſo much as ſuſpected, that they could exchange that Quality for the contrary one, and then come back from that contrary one to their old State again: That they ſhould paſs from Opake to Pellucid, and from Pellucid to Opake; at one time admit, and at another time oppoſe the Paſſage of Light: And all this by a meer change of external Circumſtances. This Property I ſay is as new as 'tis real and ſurprizing; and the bare Conſideration of ſo very unlikely and unexpected a thing, may be a ground of Encouragement to hope, that ſome other odd Properties of Bodies, by ſome lucky Tryals, may hereafter (as this has done) ſurprize us with a diſcovery of themſelves.

The ſame in a Glaſs lin'd with melted Flowers of Sulphur. n. 325. p 419.

2. Notwithſtanding Sealing-Wax and Pitch afford ſuch ſurprizing Phænomena, rendring the Form of Bodies viſible through their Opake Subſtances, under the Circumſtances of a Vacuum and Attrition; yet there are other Bodies, by which very different Effects will be produc'd; of which I ſhall give you a very remarkable Example: And that is in Flowers of Sulphur, or Sulphur Sublim'd. About half a Pound of this Preparation I melted in a Ladle, and pour'd it into a Globe Glaſs, and uſed it in all reſpects as in the other Experiments. And when it was exhauſted, and Motion and Attrition given, I expected as before to have ſeen a Light on its inſide: But all that we could do had no manner of Effect on it, in relation to ſuch an Appearance, neither when it was exhauſted, nor when replete with Air: There was nothing to be obſerv'd but a very ſmall weak Light, which after long rubbing, ſhew'd it ſelf in that part where the Hand touch'd the Glaſs. But when I came to look upon it, I found the ſulphurous Lining all in a body diſengag'd from the Concave ſurface of the Glaſs. As to the Electricity of the Globe lin'd with this ſort of Matter; after the Attrition of it had been continued for ſome time, and the Glaſs was become pretty warm (at the ſame time full of common Air) the Hoop of Threads was held over it; but the Attraction was very inconſiderable on the lin'd part, though on the tranſparent ſide the Threads were pretty vigorouſly directed; yet not with that force and ſtrength, as when the Glaſs is perfectly clear within, as this was not; becauſe the Fumes of the melted Sulphur adhering to it, made it appear ſomewhat Cloudy.

With Common Sulphur.

3. I took a quantity of common Sulphur, nearly equal to what I had uſed before of the Flowers; which having melted as before, I pour'd it into another Globe-Glaſs, which I us'd in all Reſpects as the former. But when I had exhauſted it, and given the uſual Motion and Attrition, the Effect was ſo ſurprizingly different, that one would ſcarce think it ſhould proceed from the ſame ſort of body. For the Figure of my Hand and Fingers appear'd not only on its inſide, (though more faint and pale than in the Experiments of Sealing Wax and Pitch,) but on its outſide there appear'd a briſk purple Light, ſo beautiful and agreeable to the Eye, that it was very pleaſant to behold. The Strength of this Light may be judged from hence, That the Lines of the Palm of my

Hand, which being near the touching Parts, were eaſily diſcoverable by it; and were a ſmall Print plac'd at the diſtance, I queſtion not but it would be legible without any great Difficulty. And as this common Sulphur differ'd vaſtly in that part of the Experiment already related, from the former, ſo likewiſe in the latter; for when the Hoop of Threads came to be held over it, (under the ſame Circumſtances as in the other) they were directed toward it as vigorouſly as in any Experiment heretofore made. The parts lin'd and tranſparent perform'd much alike; if there was any Difference, it ſeem'd to incline to that part lin'd with the Sulphur. Likewiſe in this Experiment as in the laſt, the Sulphur was looſen'd and ſeparated from the Glaſs that contain'd it: which therefore cannot be urg'd, as any ways conducible to the Unſucceſsfulneſs of the former.

With a larger quantity of Sulphur.

4. Into a Globe Glaſs of the ſame ſize of the former, which was about five Inches Diameter, I pour'd about two Pound of melted Sulphur: This, when cold, contracted it ſelf, and became looſe from every part of the Glaſs, as in the former Experiments: The Sulphur cover'd more than half the inward ſurface of the Globe, and its thinneſt part was about half an Inch in Thickneſs. Towards the Axis it appear'd to be more than a full Inch in Subſtance. This Glaſs, when exhauſted of its Air, was uſed in every thing as the former. The Light produc'd was very conſiderable, I mean that on its outſide, and attended with the ſame Colour and Vivacity as before; nor was that leſs vigorous on its inſide. Comparing it with the former, notwithſtanding the Thickneſs of the Lining, it was at leaſt four times greater; but the Figure of the Fingers was now not ſo diſtinguiſhable as in the other. But on the part near the Axis (as I hinted before) where the ſubſtance of the Sulphur was much the greateſt, no Light was produc'd; which may be attributed in a great meaſure to the Slowneſs of the Motion and the Weakneſs of it there, in Compariſon with that which is made more remote from it, where it was that the Light was ſeen within. What farther is obſervable, was that the Light which was viſible on its outſide only, appear'd to be produc'd between the inward Surface of the Glaſs and the Convex Surface of the Sulphur; the Sulphur being looſe from it gave liberty for the Air to be taken from thence as well as from the other Parts: The Light which was there produc'd, being reflected by the hard, poliſh'd, and nearly contiguous Body of Sulphur, ſeems to me to be the Reaſon why it appear'd with ſo much Vigour. This outward Light would ſometimes break into Branches all over the lin'd part of the Globe, in as odd, and as pleaſant a manner, as what has been taken notice of in former Experiments, with the large Globe Glaſs, upon letting in a little Air. And what farther occur'd in this Experiment was, that when the Attrition was ceas'd, but the Globe continuing its Motion, abundance of Sparks of Light would appear all round it, and continue ſo to do for ſome time, without any freſh Attrition. I cannot conclude without taking ſome notice, that in the Experiments formerly made on Sulphur, mention'd in my Book of *Phyſico-Mechanical Experiments*, I us'd the ſame

ſort as in the firſt of theſe; and had it been my Chance to have happen'd on the common ſort, I doubt not but the Succeſs of it would have been different from what is there related, which I hope to try at one time or other.

Hence we may ſee what remarkable Changes may be produc'd in Bodies, with reſpect to their electrical and luminous Qualities, by their different Management and Preparation: As here 'tis plain that common Sulphur, which is plentifully endow'd with both theſe Qualities, by undergoing the Chymical Fire (which *ſublimes* it into Flowers,) is almoſt totally depriv'd of them both.

Of keeping Fiſhes in Water under different Circumſtances, by Mr. Hauksbee, *n.* 333. *p.* 431.

L. The Fiſhes made uſe of in the following Experiments were Gudgeons; which are a ſort of Fiſh very brisk and lively in the Water, and will live a pretty conſiderable time out of it. Three of them I put into a Glaſs Veſſel, to about three Pints of common Water (which Fiſhes were to be a Standard to compare the others by.) Into another Glaſs, to a like quantity of Water, I put three more of them, which quantity of Water juſt fill'd this Glaſs to the very Brim; upon which I ſcrew'd down a Braſs Plate with a Leather between, to prevent a Communication with the Water in the Glaſs and the external Air: And that it might the better reſemble a Pond of Water frozen over (on which account this Experiment was made) I ſuffer'd as little Air as poſſible to remain on the Surface of the included Water. The third Glaſs had a like quantity of Water put into it as the former; which Water, firſt by boyling, then by continuing it a whole Night in *Vacuo* on the Air Pump, was purg'd of its Air to the greateſt nicety: Into this Water alſo, I put a like number of Gudgeons as into the other. Thus (the Fiſhes being all put into their reſpective Receivers) I apply'd my ſelf to wait the Event; which was as follows. It was about half an Hour after ten in the Morning when I began the Experiments; and in about half an Hour from that time, I obſerv'd the Fiſhes in the exhauſted Water, or Water purg'd of its Air, began to diſcover ſome Uneaſineſs, by a more than ordinary Motion in their Mouths and Gills, or Reſpiration, if I may call it ſo, differing from the Fiſhes in the other Glaſſes; the included Fiſhes at the ſame time diſcovering no Alteration; only I took notice that they would now and then aſcend to the top of the Water, but ſuddenly ſwim down again: And in this State they continued for ſome conſiderable time, without any ſenſible Alteration. About 5 Hours after the laſt Obſervation, the Fiſhes in the exhauſted Water became not ſo active (upon a Motion given the Glaſs that contain'd them) as before; And thoſe Gudgeons included without any Communication with the outward Air, now began conſiderably to abate of their Vivacity; yet ſtill continued at times their Motions upward and down again. At Seven in the Evening, the included Fiſhes lay all at the bottom of the Glaſs, with their Bellies upwards; nor upon ſhaking the Glaſs, could I put them in Motion, or cauſe them to ſtir their Fins or Tail; only I could obſerve a Motion in their Mouths, which ſhew'd me they were not perfectly dead.

In this State they lay for ſome time: But conſidering the Experiment would not be compleat, if I did not attempt their Recovery by taking off the braſs Cover, being very ſure they muſt have dy'd in ſome ſmall time under the Circumſtances they were then in, accordingly I took off the Cover, and gave the Surface of the Water a free and open Communication with the external Air. At about ten at Night, I obſerv'd them again; at which time their Recovery was ſo evident, that upon a little diſturbing the Glaſs that contain'd them, they were actually in Motion again: And at this time alſo, the Fiſhes in the Water purg'd of Air, began to appear more brisk and lively than at the laſt Obſervation. Here I cannot but take notice, that notwithſtanding the Water was purg'd of its Air to a very great degree, yet the Fiſhes put into it did not ſo much as once aſcend in it; but continued always at the bottom, as the Fiſhes did in the common Water. At this time I left them till the next Morning; when about Eight a Clock I found them as perfectly well and lively in all the Glaſſes, as when they were firſt put in. Thoſe in the common Water expos'd to the open Air, ſuffer'd no manner of Change during the whole time. After this I was willing to try whether the Air had again inſinuated itſelf into the purg'd Water, and whether that might not be the occaſion of the Fiſhes Recovery. Accordingly I put it on the Plate of my Pump, in the ſame Glaſs with the Fiſhes in it; and being cover'd with another Receiver, the Air was taken from it; yet I could perceive very little Air aſcend in it, and to me it ſeem'd to be much in the ſame State as when the Fiſhes were firſt put in. I continu'd it in *Vacuo* about an Hour and half; the Fiſhes almoſt all the time continued at the top of the Water, and at that time appeared as dead; for upon letting in the air, they ſunk haſtily to the bottom, without any Motion of their Fins or Tails.

From the whole account I obſerve,

Firſt, That Water purg'd of air, ſo far as the Method here made uſe of is capable to do it, renders it not altogether unfit to ſupport the Lives of Water Animals. For although when the Fiſhes were firſt put in, and for ſome Hours after, they ſeem'd to ſuffer ſome Uneaſineſs; yet at length the Water became more familiar to them, or their Conſtitutions in ſome meaſure did ſo conform, as to render the Water to them, and them to the Water more agreeable: Otherwiſe I do not ſee how their Recovery ſhould follow, ſince upon examining, little or no alteration could be found in the Circumſtances of the Water, from the time the Fiſhes were firſt put in.

Secondly, The Fiſhes included with the Water from any Communication with the external Air, plainly demonſtrate, that common Water in its natural State is not alone ſufficient to preſerve the Lives of its natural Animals. Hence it follows, That in Ponds, when the Water comes to be frozen over with a pretty thick Ice, the Fiſhes in the ſaid Ponds are very likely, if not certain to periſh, upon the Continuance of ſuch a Congelation for ſome time on their Surfaces; unleſs (as in the latter part of the Experiments) the Impediment, which hinder'd the immediate Contact of the Air to the Surface of the Water be remov'd; that is, by breaking Holes in the Ice, whereby it is reſtored, and undoubtedly will perform the ſame thing as my Removal of the braſs Plate. This is to be underſtood only in Ponds, where the Water is ſtagnant; for where there are Springs, or a current of Water conſtantly ſucceeding under the Ice, the Effect moſt likely will not be the ſame.

Of the Attraction of Oil between two Glaſs Planes, n. 332. p. 395. Plate 4. Fig. 4.

LI. The glaſs Planes which I uſed were about 6 Inches ſquare; and being very clean, a drop or two of Oil of Oranges was let fall on the lower Plane, ſuppoſe at *B*; then the upper Plane was laid on it, ſo near as to touch the Liquid, that it might become contiguous to both their Surfaces. Thus the Planes being made to touch one another at the ſide *A*, and open'd at the ſide *C*, as in the Scheme above, the lower Plane lying parallel with the Horizon, the drop of Oil would immediately move towards the touching ſide of the Planes; and when it was arrived there, it was but reverſing the Angle, and the drop would return from *A* to *C*; and after the ſame manner it might be directed to any ſide or part of the ſame. Moreover, if the Planes were elevated 8 or 10 degrees at *A*, yet would the drop aſcend towards the ſide *A*, tho' not ſo ſwift as when the Planes were in the fore-mention'd Poſition. It was farther to be obſerved, that the nearer the drop approach'd the touching ſide, ſo would the Velocity of its Motion be encreaſed: The reaſon of which ſeems very plain, allowing the aſcent of Water in ſmall Tubes, and between the Surfaces of nearly contiguous Planes, to be explain'd from the Power of Attraction that one Surface has to another at ſuch a Nearneſs (as I ſee no reaſon to doubt of it:) For the drop of Oil moving on towards the contiguous Surfaces, comes to enlarge its ſpace, and touches the Planes in more and more Parts, as it approaches nearer and nearer the touching ſide. Thus in the whole Progreſs of its Motion, it is continually encreaſing in its Surface, and conſequently the Power of Attraction muſt encreaſe in proportion to that Surface; ſo that the Celerity of its Motion muſt neceſſarily be augmented. This Experiment ſeems very powerfully to confirm the Experiments made before on the ſame Subject, from the gradual increaſe of the Motion of the Drop; repreſenting thereby the ſeveral Appearances of the aſcent of Water in different ſiz'd Tubes, or between Planes whoſe Surfaces are placed at different Diſtances, the ſlower Motion repreſenting thoſe Experiments made in larger, and the ſwifter in ſmaller Tubes; the ſame to be obſerved in different diſtanc'd Planes.

I have ſince repeated the ſame Experiment in *vacuo*, where in all Reſpects, it anſwered as in the open Air; which is a plain Indication, that the Preſence of the Air has nothing at all to do in producing this *Phænomenon.*

Of the Angle requir'd to ſuſpend a drop of Oil of Oranges, at certain Stations between two Glaſs Planes, n. 334. p 473.

LII. I procured two glaſs Planes that meaſured a *Radius* of twenty Inches each; their breadth was about 3 Inches: That which I uſed for the lower Plane, was plac'd with its Surface parallel with the Center of its *Axis*, and parallel with the Horizon. Thus (the Planes being very clean) they were rubb'd with a clean Linnen Cloth dipt in Oil of Oranges: Then a drop or two of the ſame Oil being let fall on the lower Plane near the Axis, the other Plane was laid on it; which ſo ſoon as it touch'd the Oil, the Oil ſpread itſelf conſiderably between both their Surfaces. Then the upper Plane being raiſed a little at the ſame end by a Screw, the Oil immediately attracted it ſelf into a Body, forming a Globule contiguous to both Surfaces, and began to move forwards toward the touching ends. When it had arriv'd two Inches from the *Axis*, an Elevation of 15 Minutes at the touching ends ſtopt its Progreſs, and it remain'd there without Motion any way. The Planes being let fall again, the drop mov'd forward till it came to four Inches from the Center; then an Elevation of 25 Minutes was requir'd to give it a fixt Station. At 6 Inches it requir'd an Angle of 35 Minutes; at 8, of 45 Minutes; at 10, a Degree. At 12 Inches from the *Axis*, the Elevation was 1 Degree 45 Minutes; and ſo on, at the ſeveral Stations, as they ſtand in the following Table. This, after abundance of Tryals, I take to be the moſt correct, tho' the others ſucceeded very little different from the ſame. It is to be obſerved, That when the Globule or Drop, had arriv'd to near 17 Inches on the Planes from their *Axis*, it would become of an Oval form; and as it aſcended higher, ſo would its Figure become more and more oblong; and unleſs the Drop was ſmall, upon ſuch an Elevation of the Planes as was requir'd at ſuch a Progreſs of the Drop, it would be parted, ſome of it deſcending, and the reſt of it running up to the top at once: But upon a Drop that ſeparated thereabouts, I found the remaining part of it at 18 Inches, would bear an Angle of Elevation equal to 22 Degrees to ballance the weight of it. Higher than that I could not obſerve. The Planes were ſeparated at their *Axis* about $\frac{1}{16}$ of an Inch. I found but little difference between ſmall and larger Drops of the Oil, in relation to the Experiment. The Angles were meaſured by a Quadrant mark'd on Paper of near 20 Inches *Radius*, divided into Degrees and Quarters.

Diſtance in Inches from the Axis.	Angle of Elevation. D.	M.
2	0	15
4	0	25
6	0	35
8	0	45
10	1	00
12	1	45
14	2	45
15	4	00
16	6	00
17	10	00
18	22	00

Plate V. Part III. P. 181.

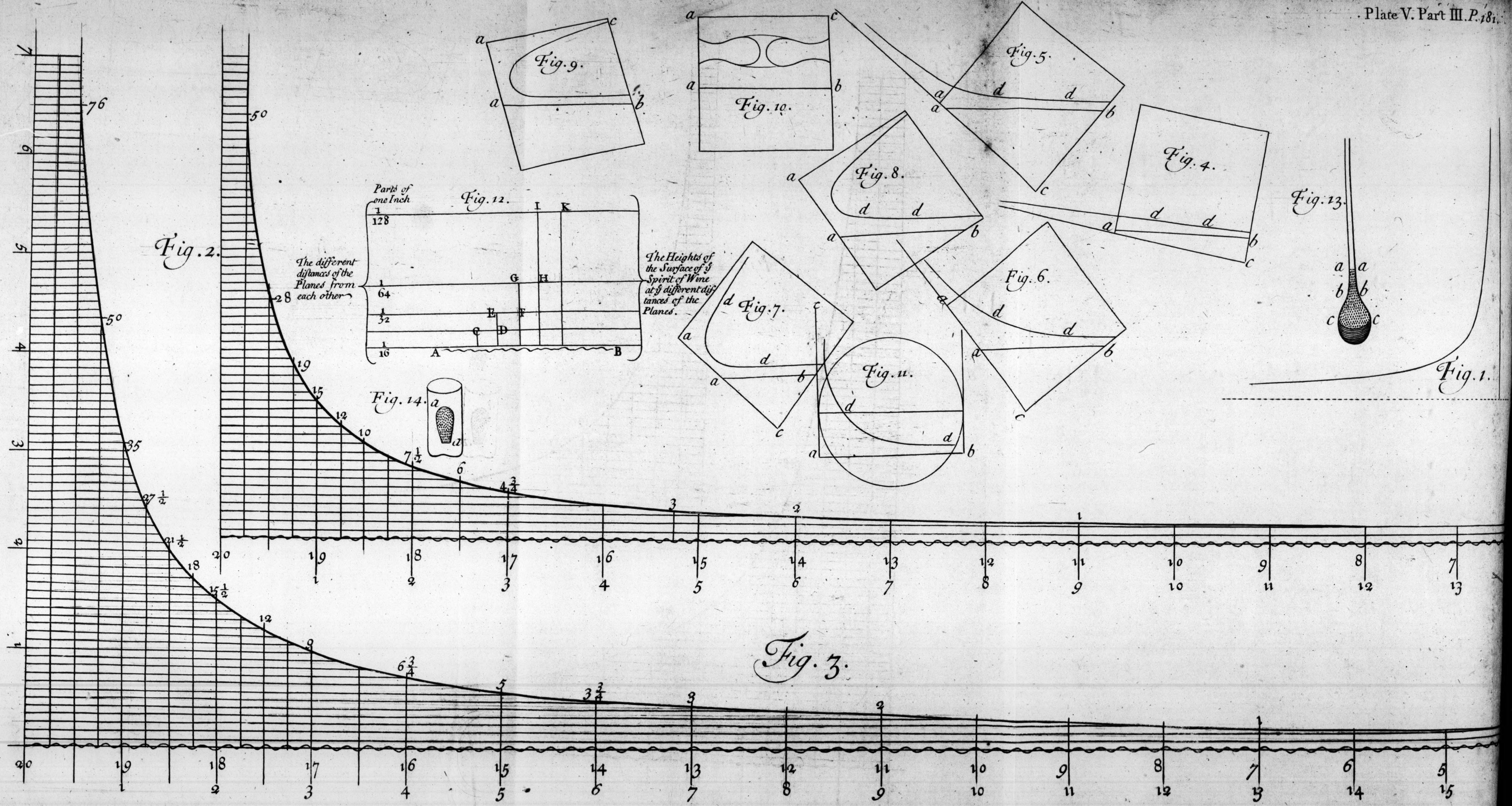


Fig. 1.
Fig. 2.
76
50
35
27 ½
21 ½
18
15 ½
12
9
6 ¾
5
3 ¾
3
2
1
28
19
15
12
10
7 ½
6
4 ¾
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Parts of one Inch
1/128
1/64
1/32
1/16
The different distances of the Planes from each other
The Heights of the Surface of ye Spirit of Wine at ye different distances of the Planes.
A
B
C
D
E
F
G
H
I
K
Fig. 13.
Fig. 14.
a
b
c
d

Of the aſcent of Water between two Glaſs Planes, by Dr. Taylor, *n. 336. p. 538. Plate 5. Fig. 1.*

LIII. 1. I faſten'd two pieces of Glaſs together, as flat as I could get; ſo that they were inclin'd in an Angle of about 2° and $\frac{1}{2}$. Then I ſet them in the Water with the contiguous edges perpendicular. The upper part of the Water by riſing between them, made this Hyperbola, which I copied from the Glaſs. I have examined it as well as I can, and it ſeems to approach very near to the common Hyperbola; but my Apparatus was not nice enough to diſcover this exactly. The perpendicular Aſymptote was exactly determin'd by the edge of the Glaſs, but the horizontal one I could not ſo well diſcover: not having Conveniences to make it in ſo ſucceſsful a manner as I could wiſh.

—— *by* Mr Hauksbee, *ib. p.* 539.

2. I took two glaſs Planes, each ſomewhat more than 20 Inches long, of the trueſt Surfaces I could procure. Theſe being held cloſe together at one of their Ends, the other Ends were opened exactly to an Angle of 20 Minutes. In this Form they were edgeways put into a Trough of ting'd Water, which immediately aroſe between them in the Figure of the annext Scheme. At another time the Planes were opened to an Angle of 40 Minutes; then the Water appear'd between them, as in the Scheme with that Title. By theſe Schemes the Proportions of the Power of Attraction are in ſome meaſure evident to the Eye; for there may be ſeen at the ſeveral Diſtances, how many Lines (which are 12ths of Inches) the Water is elevated, and the prodigious increaſe of them near the touching Ends. I hope the Tables are pretty accurate; for after many Tryals, I find the Succeſſes to be much the ſame, according to the different Angles.

Plate 5. Fig. 2. & 3.

A Table according to the Scheme of the Planes opened to an Angle of 40 *Minutes, in* Fig. 2.

Diſtances in Inches and Parts of Inches from the touching Ends.	Number of Lines elevated at the ſeveral Diſtans.
9.	1.
6.	2.
$4\frac{3}{4}$.	3.
3.	$4\frac{3}{4}$
$2\frac{1}{2}$.	6.
2.	$7\frac{1}{2}$
$1\frac{1}{2}$	10
$1\frac{1}{4}$	12
1	15
$0\frac{3}{4}$	19.
$0\frac{1}{2}$.	28.
$0\frac{1}{4}$	50.

A Table according to the Scheme of the Planes opened to an Angle of 20 *Minutes, in* Fig. 3.

Diſtances in Inches and Parts of Inches from the touching ends.	Number of Lines elevated at the ſeveral Diſtances.
13.	1.
9.	2.
7.	3.
6.	3.$\frac{3}{4}$
5.	5.
4.	$6\frac{3}{4}$
3.	9.
$2\frac{1}{2}$.	12.
2.	$15\frac{1}{2}$
$1\frac{3}{4}$.	18.
$1\frac{1}{2}$.	$21\frac{1}{2}$.
$1\frac{1}{4}$.	$27\frac{1}{2}$
1.	35
$0\frac{3}{4}$.	50
$0\frac{1}{2}$.	76

The

n. 337. p. 153. The Figure of the Hyberbolick Curve above-mention'd gave me occaſion to make further Enquiries; and by many Experiments I find, that the ſame Curve holds in all Directions of the Planes, the Aſymptotes being always, one the Surface of the Water, the other a Line drawn along the touching Sides. Thus, when the touching Sides were plung'd under the Surface of the Water, and the Angle *c* was depreſs'd and made to remain lower than the Angle *a.* as in *Fig.* 4. then would be produc'd ſuch an oblique Curve, as may be obſerv'd in that Figure. *Plate* 5. In all the ſeveral Schemes, *a b* repreſents the Surface of the Water on the outſide of the Planes, and *a c* the touching Sides of the ſame. Now, though the Curve *d d* riſes between the Planes in ſuch an obliquity, yet does it conform it ſelf in its Figure to the Aſymptotes, viz. *ab* the Surface of the Water, and *a c* the touching Sides of the Planes; for ſuppoſing the Aſymptote *a c* to be continued, as in the prick'd Line, till it ſurmounts the Surface of the Water to ſuch a height; or ſuppoſe the Planes extended in the ſame manner; then would the Water remain between them in the appearance of the prick'd Lines, being at all diſtances from the Axis of the Curve, equal in reſpect to the Aſymptotes; and ſo of all the reſt of the Curves, as in the Figures 5, 6, 7, 8, 9. which are the reſult of the ſeveral Angles, made by the touching Sides of the Planes. Now when the touching Sides were plac'd upwards, parallel to the Surface of the Water (as in *Figure* 10.) and plung'd wholly under the ſame, then upon lifting them up, in the ſame Poſition, till the weight of the Water between the Planes over-ballanc'd the Power of their Attraction; two Curves, one from each ſide of the Planes, would open themſelves, and meet each other in the middle, as repreſented in the aforeſaid Figure; where they would unite, and make a Figure as joined by the prick'd Lines, being wider in the middle than towards the ſides of the Planes. And it is highly remarkable, that this Curve would always break out between the Planes, at an equal diſtance between the touching ſides and the Surface of the Water.

The ſame Figure is likewiſe produc'd between two round glaſs Planes, (ſee *Fig.* 11.) the Aſymptotes being the ſame as the former; that is to ſay, one the Surface of the Water, the other a Tangent drawn from the touching Point, parallel to a Tangent drawn from the open or oppoſite part of the Planes, being at right Angles with a Line drawn through the Axis of the ſame. Theſe Experiments I find to anſwer the ſame in *Vacuo*, as in the open Air; ſo that that Element has nothing to do in this extraordinary appearance.

The Planes made uſe of in the foregoing Experiments were about 7 Inches ſquare, open'd on one ſide to an Angle of 20 Minutes or thereabouts; the round Planes were in Diameter near 3 Inches.

Of the aſcent of Spirit of Wine between two Glaſs Planes, by Mr. Hauksbee, *ib.p.*151.

LIV. I took two glaſs Planes, about 6 Inches long, and two broad: Theſe (being made clean) I ſeparated at each end by the number of 32 pieces of braſs *Lamina*, whoſe Thickneſs, when laid one upon another, and preſs'd together by Screws, made a diſtance between the Planes equal to (as near as I could meaſure) $\frac{1}{16}$ of an Inch. Being thus prepar'd, I plung'd one end of them into ſometing'd Spirit of Wine; and after I had wetted the inward Surfaces of the Planes with it, by declining the upper end, I ſet them upright; and found that the Surface of the Wine between them remain'd higher than the Surface of the Wine on their outſides, by a diſtance equal to the firſt Line *CD* above the Line *AB*, the Line *AB* being the *Plate* 5 *Fig.* 12. common Surface, in all the Tryals, on the outſide of the Planes. After this, I reduc'd the diſtances of the Planes to half the former, by taking away 16 of the braſs *Laminæ* from each end of them; then being plung'd into the Liquid, and uſed in all reſpects as before, I found the Wine to ſtand between the Planes juſt double the height it ſtood at in the former Tryal; as may be obſerv'd by the Line *E F* in the Scheme. Again removing half the number of braſs pieces, whereby but 8 of them were left at each end, and uſing them as in the preceeding manner, the Wine roſe between them to a height juſt double to that in the foregoing Tryal, mark'd in the Scheme by the Line *G H*. Thus from 8 I reduc'd them to 4 pieces at each end of the Planes; then again the Wine was ſeen to remain ſuſpended to twice the laſt obſerv'd height, repreſented by the Line *I K*. In this laſt tryal the Planes were diſtant one from the other but $\frac{1}{128}$ of an Inch; nearer than that I could make no certain Meaſure; but I ſuppoſe the forecited Experiments are ſufficient to ground a Calculation upon, even of the moſt near Approximations.

The Spirit of Wine did not move between the Planes with that *ib. p.* 155. nimbleneſs as Oil of Oranges, which gave me the Liberty to obſerve the Angles with more Deliberation. The Limb on which the Planes were laid, mov'd in the Center of a Quadrant of a four Foot *Radius*; the Largeneſs of which gave me conveniency of meaſuring the Angles with greater accuracy: But the diſtance between the Drop on the Planes and the Graduations on the Quadrant, made it a little difficult to obſerve them both at once. Yet I believe the following Tables may be depended on to be as true as the nature of ſuch an Experiment (for *v ſupra p.* 180. any thing that I ſee at preſent) is capable of. I have formerly given a particular account of the manner of making this Experiment. Theſe Tables are calculated from the touching Ends of the Planes; and it is to be obſerv'd, That in the Table where the Planes were open'd but to an Angle of 10′ that I could not come nearer than 4 Inches of the touching Ends in my Obſervations: But ſo far as I could go, ſeems to be much in the ſame Proportion (as I have oftentimes obſerved in the courſe of theſe Experiments) with the Table where the Planes were opened to an Angle of 18′.

Diſtances

Diſtances in Inches from the touching Ends.	Angle of Elevation. D.	M.
18½	0	45
16½	0	55
14½	1	05
12½	1	20
10½	1	30
9½	1	40
8½	2	00
7½	2	30
6½	3	20
5½	4	25
4½	6	00
4	7	23
3¾	8	40
3½	9	25
3¼	10	30
3	12	40
2¾	15	00
2½	18	50
2¼	23	25
2	30	00

The Planes open'd to an Angle of 18′.

Diſtances in Inches from the touching Ends.	Angle of Elevation. D.	M.
18½	1	30
16½	1	50
14½	2	10
12½	2	40
10½	3	10
9½	3	30
8½	4	00
7½	5	05
6½	7	40
5½	10	50
4½	14	00
4	18	00

The Planes opened to an Angle of 10′

Of the Aſcent and Suſpenſion of Water in Capillary Tubes by Dr. Jurin, *n.* 355. *p.* 739.

LV. Some Days ago the following Method was propoſed to me by an ingenious Friend, for making a perpetual Motion, which ſeem'd ſo plauſible, and indeed ſo eaſily demonſtrable from an Obſervation of the late Mr. *Hawksbee*, ſaid to be grounded upon Experiment, that though I am far from having any Opinion of attempts of this Nature, yet I confeſs, I could not ſee why it ſhould not ſucceed. Upon tryal indeed I found my ſelf diſappointed. But this Propoſal has given occaſion not only to rectify ſome Miſtakes into which we had been led, by the Gentleman above named, but likewiſe to detect the real Principle, by which Water is rais'd and ſuſpended in capillary Tubes above the Level.

Plate 6.

Fig. 1. Let *ABC* be a capillary Siphon, compos'd of two Legs *AB*, *BC*, unequal both in length and Diameter; whoſe longer and narrower Leg *AB* having its Orifice *A* immerſt in Water, the Water will riſe above the Level, till it fills the whole Tube *AB*, and will then continue ſuſpended. If the wider and ſhorter Leg *BC*, be in like manner immerſt, the Water will only riſe to ſome height as *FC*, leſs than the entire height of the Tube *BC*.

This Siphon being fill'd with Water, and the Orifice *A* ſunk below the Surface of the Water *DE*, my Friend reaſons thus.

Plate VI. Part III. *P.* 184.

Fig. 1.

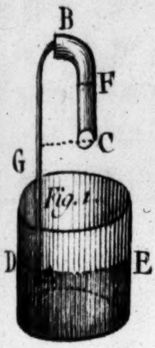


Fig. 2.

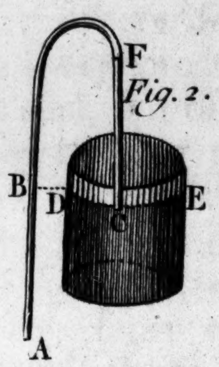


Fig. 3.

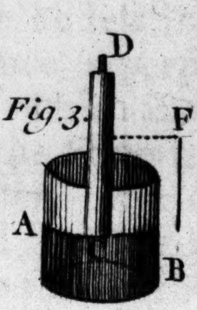


Fig. 4.

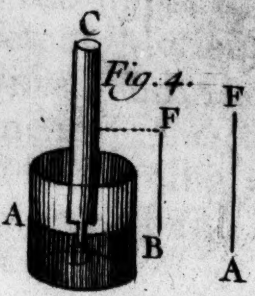


Fig. 5.

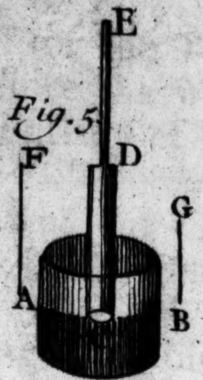


Fig. 6.

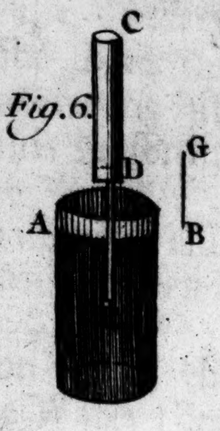


Fig. 7.

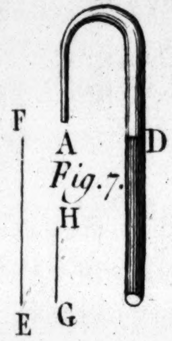


Fig. 8.

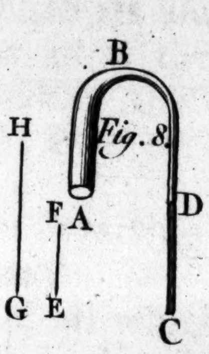


Fig. 9.

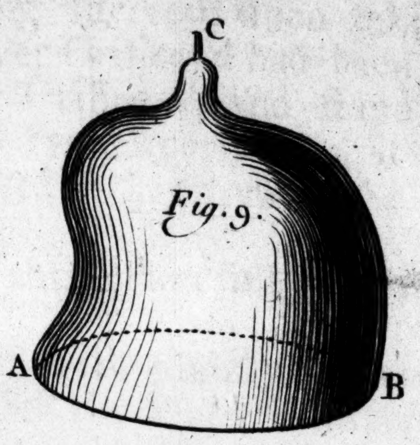


Fig. 10.

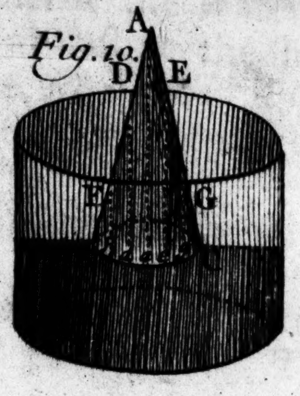


Fig. 11.

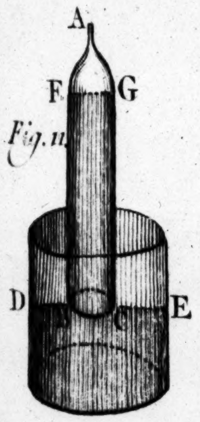


Fig. 12.

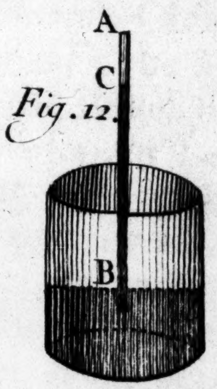


Fig. 13.

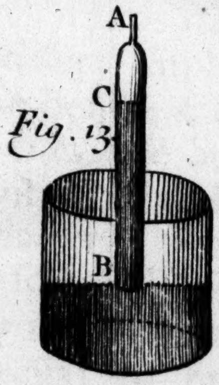


Fig. 14.

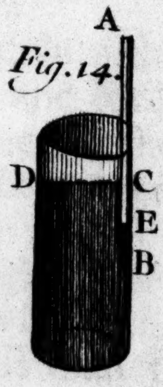


Fig. 17.

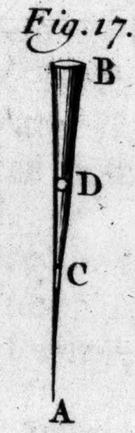


Fig. 15.

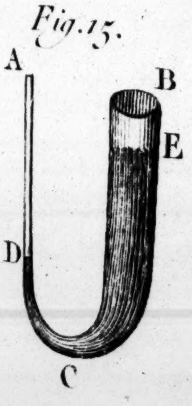


Fig. 19.

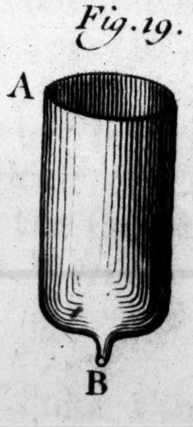


Fig. 18.

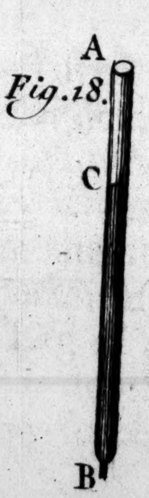
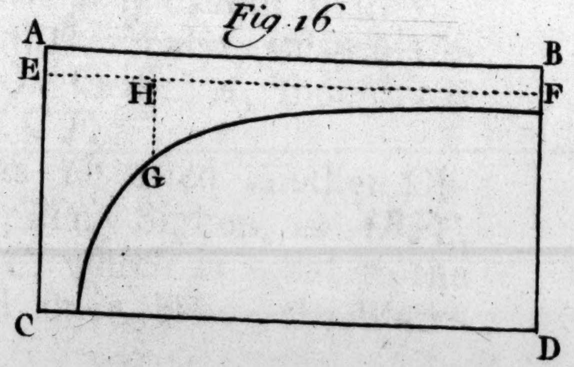
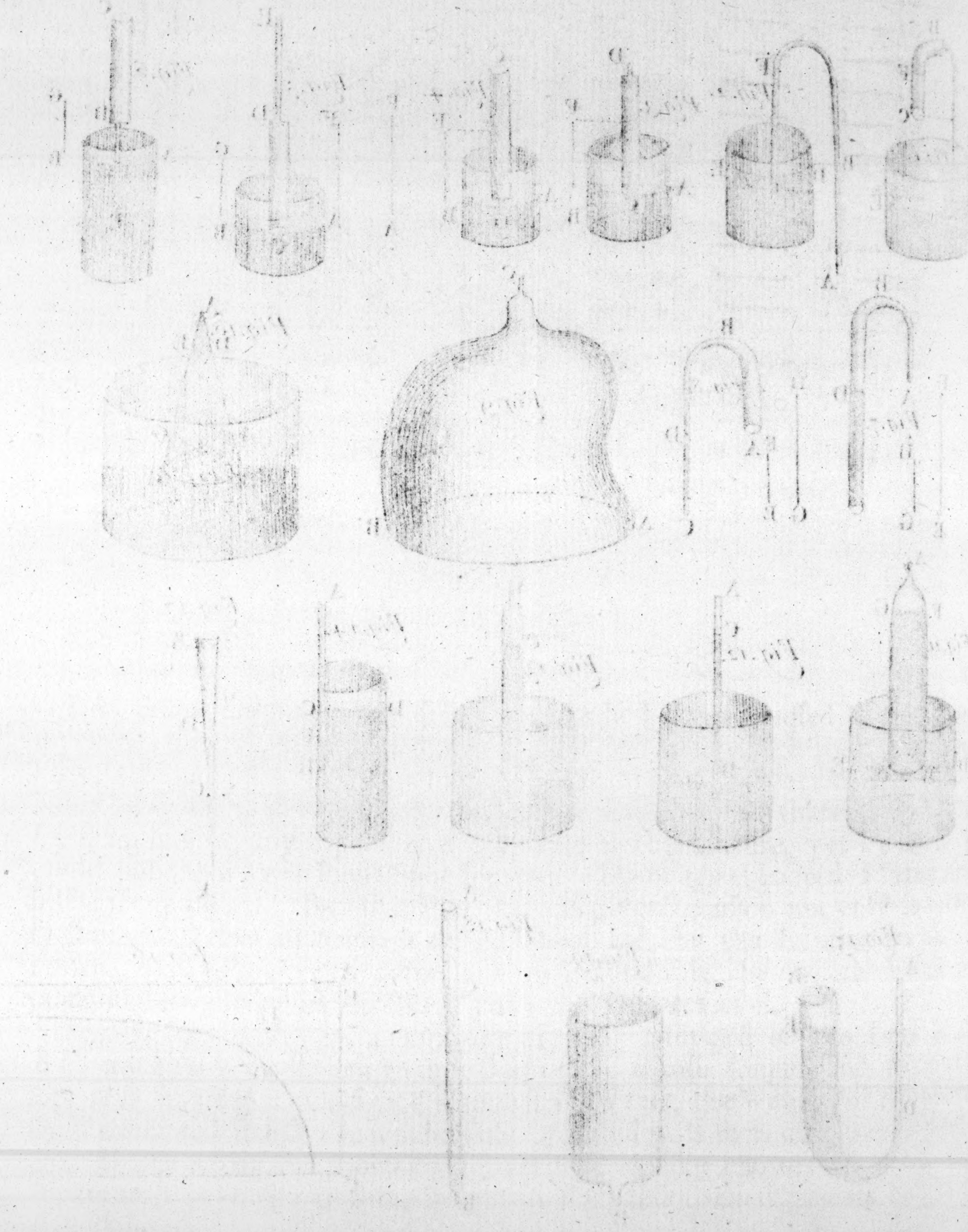


Fig. 16.





Since the two Columns of Water *A B* and *F C*, by the Suppoſition, will be ſuſpended by ſome Power acting within the Tubes they are contain'd in, they cannot determine the Water to move one way, or the other. But the Column *B F*, having nothing to ſupport it, muſt deſcend, and cauſe the Water to run out at *C*. Then the preſſure of the Atmoſphere driving the Water upward through the Orifice *A*, to ſupply the Vacuity, which would otherwiſe be left in the upper part of the Tube *B C*, this muſt neceſſarily produce a perpetual Motion, ſince the Water runs into the ſame Veſſel, out of which it riſes. But the Fallacy of this reaſoning appears upon making the Experiment.

Exp. 1. For the Water, inſtead of running out at the Orifice *C*, riſes upward towards *F*, and running all out of the Leg *BC*, remains ſuſpended in the other Leg to the height *A B*.

Exp. 2. The ſame thing ſucceeds upon taking the Siphon out of the Water, into which its lower Orifice *A* had been immerſt, the Water then falling in drops out of the Orifice *A*, and ſtanding at laſt at the height *AB*. But in making theſe two Experiments, it is neceſſary that *A G* the difference of the Legs exceed *F C*, otherwiſe the Water will not run either way.

Exp. 3. Upon inverting the Siphon full of Water, it continues without Motion either way.

The reaſon of all which will plainly appear, when we come to diſcover the Principle, by which the Water is ſuſpended in Capillary Tubes.

Mr. *Hawksbee*'s Obſervation is as follows.

Fig. 2. Let *A B F C* be a capillary Siphon, into the which the Water will riſe above the Level to the height *C F*, and let *B A* be the depth of the Orifice of its longer Leg below the Surface of the Water *D E*. Then the Siphon being fill'd with Water, if *B A* be not greater than *C F*, the Water will not run out at *A*, but will remain ſuſpended.

This ſeems indeed very plauſible at firſt ſight. For ſince the Column of Water *F C* will be ſuſpended by ſome power within the Tube, why ſhould not the Column *B A*, being equal to, or leſs than the former, continue ſuſpended by the ſame Power?

Exp. 4. In fact, if the Orifice *C* be lifted up out of the Water *D E*, the Water in the Tube will continue ſuſpended, unleſs *B A* exceed *F. C*.

Exp. 5. But when *C* is never ſo little immerſt in the Water, immediately the Water in the Tube runs out in drops at the Orifice *A*, though the length *A B* be conſiderably leſs than the height *C F*.

Mr. *Hawksbee* in his Book of Experiments has advanced another Obſervation, namely, that the ſhorter Leg of a Capillary Siphon, as *ABFC*, muſt be immerſt in the Water to the depth *F C*, which is equal to the height of the Column, that would be ſuſpended in it, before the Water will run out at the longer Leg.

Exp. 6. From what Miſtake this has proceeded, I cannot imagine; for the Water runs out at the longer Leg, as ſoon as the Orifice of the ſhorter leg comes to touch the Surface of the ſtagnant Water, without being at all immerſt therein.

I go on to enquire into the Cauſe of the aſcent and ſuſpenſion of Water in Capillary Tubes.

That this Phænomenon is no way owing to the preſſure of the Atmoſphere, has been I think ſufficiently prov'd by Mr. *Hawksbee*'s Experiments.

And that the cauſe aſſign'd by the ſame, namely the attraction of the concave Surface, in which the ſuſpended Liquor is contain'd, is likewiſe inſufficient for producing this Effect, I thus demonſtrate.

Since in every capillary Tube the height, to which the Water will ſpontaneouſly aſcend, is reciprocally as the Diameter of the Tube, it follows, That the Surface containing the ſuſpended Water in every Tube is always a given Quantity: but the Column of Water ſuſpended is, as the Diameter of the Tube. Therefore, if the attraction of the containing Surface be the cauſe of the Waters ſuſpenſion; it will follow, that equal Cauſes produce unequal Effects, which is abſurd.

To this it may perhaps be objected, That in two Tubes of unequal Diameters, the Circumſtances are different, and therefore the two Cauſes, though they be equal in themſelves, may produce Effects that are unequal. For the leſſer Tube has not only a greater Curvature, but thoſe parts of the Water, which lie in the middle of the Tube, are nearer to the attracting Surface, than in the wider. But from this if any thing follows, it muſt be, that the narrower Tube will ſuſpend the greater quantity of Water, which is contrary to Experiment. For the Columns ſuſpended are as the Diameters of the Tubes.

But as Experiments are generally more ſatisfactory in things of this nature, than Mathematical reaſonings, it may not be amiſs to make uſe of the following, which appear to me to contain an *Experimentum Crucis.*

Fig. 3. The Tube *C D* is compoſed of two parts, in the wider of which the Water will riſe ſpontaneouſly to the height *B F*, but the narrower part, if it were of a ſufficient length, would raiſe the Water to a height equal to *C D*.

Exp. 7. This Tube being fill'd with Water, and the wider end *C* immerſt in the ſtagnant Water *A B*, the whole continues ſuſpended.

Exp. 8. *Fig.* 4. The narrower end being immerſt, the Water immediately ſubſides, and ſtands at laſt at the height *D G* equal to *B F*.

From which it is manifeſt, that the Suſpenſion of the Water in the former of theſe Experiments is not owing to the attraction of the containing Surface: ſince, if that were true, this Surface being the ſame, when the Tube is inverted, would ſuſpend the Water at the ſame height.

Having ſhown the inſufficiency of this Hypotheſis, I come now to the real Cauſe of that Phænomenon, which is the attraction of the Periphery, or Section of the Surface of the Tube, to which the upper Surface of the Water is contiguous and coheres.

For this is the only part of the Tube, from which the Water muſt recede upon its ſubſiding, and conſequently the only one, which by the force of its Co-heſion, or Attraction, oppoſes the deſcent of the Water.

This likewiſe is a cauſe proportional to the Effect, which it produces; ſince that Periphery, and the Column ſuſpended, are both in the ſame proportion as the Diameter of the Tube.

Tho' from either of theſe Particulars, it were eaſy to draw a juſt Demonſtration, yet to put the matter out of all doubt, it may be proper to confirm this Aſſertion, as we have done the former, by actual Experiment.

Fig. 5. Let therefore *E D C* be a Tube, like that made uſe of in the 7th and 8th Experiments, except that the narrower part is of a greater length; and let *A F* and *B G* be the heights to which the Water would ſpontaneouſly riſe in the two Tubes *E D* and *D C*.

Exp. 9. If this Tube have its wider Orifice *C* immerſt into the Water *A B*, and be fill'd to any height leſs than the length of the wider Part, the Water will immediately ſubſide to a Level with the point *G*; but if the Surface of the contain'd Water enter never ſo little within the ſmaller Tube *E D*, the whole Column *D C* will be ſuſpended, provided the length of that Column do not exceed the height *A F*.

In this Experiment it is plain, that there is nothing to ſuſtain the Water at ſo great a height, except the contact of the Periphery of the leſſer Tube, to which the upper Surface of the Water is contiguous. For the Tube *D C*, by the Suppoſition, is not able to ſupport the Water at a greater height than *B G*,

Exp. 10. *Fig.* 6. When the ſame Tube is inverted, and the Water is rais'd into the lower extremity of the wider Tube *C D*, it immediately ſinks, if the length of the ſuſpended Column *D H* be greater than *G B*; whereas in the Tube *D E* it would be ſuſpended to the height *A F*. From which it manifeſtly appears, that the Suſpenſion of the Column *D H* does not depend upon the Attraction of the Tube *DE*, but upon the Periphery of the wider Tube, with which its upper Surface is in contact.

For the ſake of thoſe who are pleas'd with ſeeing the ſame thing ſucceed in different Manners, we ſubjoin the two following Experiments, which are in ſubſtance the ſame with the 9th and 10th.

Fig. 7. *A B C* is a Siphon, in whoſe narrower and ſhorter Leg *AB*, if it were of a ſufficient length, might be ſuſpended a Column of Water of the height *E F*; but the longer and wider Leg *BC* will ſuſpend no more than a Column of the length *G H*.

Exp. 11. This Siphon being filled with Water, and held in the ſame Poſition as in the Figure, the Water will not run out at *C* the Orifice of the longer Leg, unleſs *D C*, the difference of the Legs *A B* and *B C*, exceed the length *E F*.

Fig. 8. *Exp.* 12. If the narrower Leg *B C* be longer than *A B*, the Water will run out at *C*, if *D C* the difference of the Legs exceed *E F*; otherwiſe it will remain ſuſpended.

In theſe two Experiments it is plain, that the Columns *D C* are ſuſpended by the Attraction of the Peripheries at *A*, ſince their lengths are equal to *E F*, or to the length of the Column, which by the Suppoſition thoſe Peripheries are able to ſupport; whereas the Tubes *B C* will ſuſtain Columns, whoſe lengths are equal to *G H*.

Tho' theſe Experiments ſeem to be concluſive, yet it may not be improper to prevent an Objection, which naturally preſents it ſelf, and which at firſt view may be thought ſufficient to overturn our Theory.

Fig. 5. For ſince a Periphery of the Tube *E D* is able to ſuſtain no more than a Column of the length *A F*, contain'd in the ſame Tube; how comes it to ſuſtain a Column of the ſame length in the wider Tube *D C*, which is as much greater than the former, as the Section of the wider Tube exceeds that of the narrower?

Fig. 6. Again, if a Periphery of the wider Tube *D C* be able to ſuſtain a Column of Water in the ſame Tube, of the length *B G*; why will it ſupport no more than a Column of the ſame length in the narrower Tube *E D*?

Which Queries may likewiſe be made with regard to the 11th and 12th Experiments.

The Anſwer is eaſy, For the Moments of thoſe two Columns of Water are preciſely the ſame, as if the ſuſtaining Tubes *E D* and *C D* were continued down to the Surface of the ſtagnant Water *A B*; ſince the Velocities of the Water, where thoſe Columns grow wider, or narrower, are to the Velocities at the attracting Peripheries, reciprocally as the different Sections of the Columns.

Fig. 9. *Exp.* 13. From which Conſideration ariſes this remarkable Paradox, That a Veſſel being given of whatſoever Form, as *A B C*, and containing any aſſignable quantity of Water, how great ſoever; that whole quantity of Water may be ſuſpended above the Level, if the upper part of the Veſſel *C* be drawn out into a capillary Tube of a ſufficient Fineneſs.

Having diſcover'd the Cauſe of the Suſpenſion of Water in capillary Tubes, it will not be difficult to account for the ſeemingly ſpontaneous aſcent of it. For ſince the Water, that enters a capillary Tube as ſoon as its Orifice is dipt therein, has its gravity taken off by the Attraction of the Periphery with which its upper Surface is in contact, it muſt neceſſarily riſe higher, partly by the preſſure of the ſtagnant Water, and partly by the Attraction of the Periphery immediately above that, which is already contiguous to it.

P. S. I am oblig'd to Sir *Iſaac Newton*, and Mr. *John Machin*, for the following Obſervation, that what I call a Periphery or Section of the concave Surface of the Tube is really a ſmall Surface; whoſe Baſis is that Periphery, and whoſe height is the Diſtance, to which the attractive Power of the Glaſs is extended.

An Objection anſwer'd by the ſame, r. 363. p. 1083.

2. Soon after the foregoing Diſcourſe was printed, came out a Book publiſhed by a Member of this Society, in which the 13th Experiment therein related, was accounted for in the following Manner.

If there be a Funnel, as A BC, *Fig.* 10. *full of Water, and whoſe wide end ſtands in a Veſſel of Water as* B C; *and the top of the Funnel* A *ends in a Capillary Tube open at* A, *the whole Water will be ſuſtain'd: the Pillar* A a *by the Attraction of the Circle of Glaſs within the Tube, immediately above it; and all the reſt of the Pillars of Water, as* F f, D d, E e, G g, *&c. in ſome meaſure by the Attraction of the parts of the Glaſs above them, as* F, D, E, G; *and that the ſmall Pillars or Threads of Water* D d, *and* E e, *do not ſlide down to* F f, *and* G g, *and ſo go quite down, ſeems to be owing to their Coheſion with the Pillar* A a, *which is ſuſtained by the Capillary Tube* A: *For if you break off the ſaid Tube at* D E, *the whole Water will preſently ſink down.*

As this Solution was very different from what I had before given, and the Reputation of that Gentleman, whoſe great Knowledge in Experimental Philoſophy is generally known, was ſufficient to give weight to any of his Opinions, I thought my ſelf under an Obligation to examine his account of the Experiment, in order either to demonſtrate its inſufficiency, or to retract my own Solution. Accordingly at the next meeting of the Society, I produced the following Experiment.

The Funnel, *A F G B C*, *Fig.* 11. whoſe lower part *B C F G*, was Cylindrical to a conſiderable height, and whoſe top was drawn out into a fine Tube at *A*, being filled with Water to the height *E F*, ſo that the Surface of the Water *F G* did not reach to the arched part of the Funnel, I touch'd the end *A* with a wet Finger, whereby a ſmall quantity of Water being inſinuated into the Capillary Tube at *A*, the Water contain'd in the Funnel was ſuſpended above the level of the Water in the Ciſtern *D E*, as in the former Experiment.

In this Experiment it is manifeſt, that the little Columns, into which we may ſuppoſe the Cylinder of Water, *F G B C*, to be divided, are no way ſuſtain'd by the Attraction of the arched part of the Glaſs above them, ſince they have no contact with it. Nor is there any ſuch middle Pillar of Water, which by its contact with the Tube at top, is both ſuſtain'd it ſelf, and helps to ſupport the Pillars about it. Upon the Suppoſition of which two Particulars that Gentleman's Solution was founded.

This Experiment may be thus accounted for. The Cylinder of Water *F G B C*, by its weight balances a part of the preſſure of the Atmoſphere, which is incumbent on the Water in the Ciſtern, and endeavours to force that Cylinder upwards. The reſt of that preſſure is balanced by the Spring of the Air, *A F G*, which is included between the Cylinder of Water *F G B C*, and the little Column of Water in the capillary *A*. But, as this Air by its Spring preſſes equally every way, it muſt balance as much of the preſſure of the Atmoſphere upon the little Column of Water at *A*, as it does of that upon the Water in the Ciſtern. The remainder of the preſſure of the Atmoſphere upon the Column of Water at *A* is ſuſtain'd by the force with which that Column adheres to the capillary Tube, which therefore does exactly balance the weight of the Cylinder of Water *F G B C*, and is the real, though not the immediate Cauſe of its Suſpenſion.

The Experiment ſucceeds in the ſame manner when a Column of Quickſilver is raiſed into the Funnel, inſtead of the Column of Water *F G B C*, the top of the Tube being touch'd with a wet Finger as before. But then the height of the Quickſilver in the Funnel muſt be as much leſs than that of the Water, as its ſpecifick Gravity is greater.

The ſame Experiments in Vacuo, by the ſame, ib. p. 1085.

3. I proceed now to examine whether the Experiments therein contain'd would ſucceed *in Vacuo*; and whether Water could be ſuſpended in a wide Tube by means of a Capillary at top, at a greater height, than what it can be rais'd to by the Preſſure of the Atmoſphere.

In order to this, I boil'd ſome Water, and afterwards purged it of its Air by means of the Air-Pump; which being done, thoſe Experiments all ſucceeded in the exhauſted Receiver, in the ſame manner as in the open Air.

The 13th Experiment in particular was made with a Tube of about 35 Inches in length, and a quarter of an Inch Diameter, the top of it being drawn out into a fine Capillary. Which being fill'd with Water purged of its Air, as before mention'd, the whole quantity continued ſuſpended in the exhauſted Receiver.

This plainly ſhews, that the Succeſs of that Experiment does not depend upon the Preſſure of the Air, ſince the ſmall quantity of Air left in the Receiver was by no means capable of ſuſtaining the Water at ſo great a height, and conſequently that the height, at which Water may be ſuſpended in this manner, is not limited by that Preſſure.

But here I muſt not omit taking notice of a conſiderable Difficulty, which preſents it ſelf to thoſe who attentively conſider this Experiment. In order to make which the better appear, it will be proper to obſerve what happens, when a ſimple Capillary Tube is fill'd with Water purg'd of Air, and incloſ'd in the exhauſted Receiver.

In this Caſe the whole Column of Water contained in the Tube *ACB*, *Fig.* 12. is ſuſpended by the Attraction of the *Annulus* at the top of the Tube *A*. And though that *Annulus* does not immediately act upon any part of the water, except what is either contiguous to it, or ſo near as to be within the Sphere of its Attraction, which extends but to a very ſmall diſtance; yet it is impoſſible, that any other part of the water, as for inſtance that at *C*, ſhould part from the water above it and ſink down, becauſe its deſcent is oppoſ'd by the Attraction of the contiguous *Annulus* at *C*. For this being equal to the upper *Annulus* at *A*, is capable of ſuſtaining a Column of water of the length *A B*, and conſequently is more than ſufficient for ſupporting the Column of water below it, *CB*. From which it is plain, that no part of the water contain'd in the Tube can poſſibly deſcend, unleſs the upper part, aſſiſted by the weight of the Water below it, be ſufficient to overcome the Attraction of the *Annulus* of Glaſs at *A*.

But in ſuch a compound Tube as that made uſe of in our Experiment, *Fig.* 13. *ACB*, the Caſe is very different, and it does not eaſily appear, why in a *Vacuum* any part of the Water in the wider part of the Tube, as for Example at *C*, ſhould not leave that which is above it, and deſcend; ſince the *Annulus* at *C* is by much too wide to ſuſtain a Column of Water of ſo great a length as *C B*.

The beſt anſwer I can give to this difficulty is, That the Coheſion between the Water contain'd in the Capillary, and that below it, is ſufficient to balance the weight of the Column ſuſpended. But how far this Coheſion may depend upon the Preſſure of a Medium ſubtile enough to penetrate the Receiver, is worthy of Conſideration. For tho' ſuch a Medium will pervade the Pores of the Water, as well as thoſe of the Glaſs, yet it will act with its intire Preſſure upon all the ſolid Particles, if I may ſo call them, of the Surface of the Water in the Ciſtern; whereas ſo many of the ſolid Particles of the Water in the Tube, which happen to lie directly under the ſolid Particles of the Water above them, will thereby be ſecured from this Preſſure; and conſequently there will be a leſs Preſſure of this Medium upon any ſurface of the Water in the Tube below the Capillary, than upon an equal ſurface of the Water in the Ciſtern. So that the Column of Water ſuſpended in the Tube may be ſuſtain'd by the Difference between thoſe two Preſſures. This Explication ſeems to be favour'd by the following Experiments, which may all be accounted for in the ſame manner, though I ſhall anon mention another Cauſe, which contributes to the Succeſs of the firſt and ſecond.

The firſt I ſhall mention, is the famous Experiment of the Suſpenſion of Mercury purg'd of Air, to the height of 70 or 75 Inches, in the *Torricellian Tube*, in the open Air. To which we may add the ſuſtaining of Mercury likewiſe purg'd of Air within the exhauſted Receiver, as related by that learned and ſucceſsful Promoter of Natural Knowledge, Monſ. *Papin*, in his *Continuation du Digeſteur*. I forbear to mention the Suſpenſion of Water purged of Air, in the *Vacuum*, which he deſcribes in the ſame Book; becauſe there is little difference between that Experiment and our own abovemention'd, the very top of the arched part of his Tube, which top we may ſuppoſe as ſmall as we pleaſe, ſupplying the place of the fine Capillary at the top of our Tube. But we muſt not omit the Experiments made by the famous Monſ. *Huygens*, and deſcribed by him in † *Phil. Tranſact.* No. 86. of the cohering of poliſh'd Plates with a conſiderable force in the exhauſted Receiver; as likewiſe of the running of Water and Mercury, when purged of Air, through a Siphon of unequal Legs in the *Vacuum*: All which he accounts for from the ſame Principle, and much in the ſame manner, as we have uſed for explaining the Experiment above. As to the Exiſtence of ſuch a Medium, I ſhall content my ſelf to refer to what

† *v. Abr. Vol.* II. *p.* 24.

what has been ſaid by our illuſtrious Preſident in the Queries at the latter end of the laſt Edition of his Opticks:

Of the Action of Glaſs Tubes upon Water and Quickſilver, by the ſame. ib. p. 1088.

LV. As I have lately entertain'd the Society with ſome Experiments on Quickſilver, which were exactly the reverſe of thoſe made by Dr. *Taylor*, the late Mr. *Hawksbee* and my ſelf, upon Water; by which I am now enabled to throw this whole Affair into a little Syſtem by it ſelf, I ſhall beg leave to lay it down in the following Propoſitions, the Proof of which is contain'd in the Experiments annext.

Prop. I. *The Particles of Water attract one another.* This I think, is now univerſally acknowledged, and therefore needs no Demonſtration; the Sphericity of the drops of Rain, and the running of two drops of Water into one another upon their Contact, manifeſtly proving it.

Prop. II. *The Particles of Quickſilver attract one another.* This is likewiſe manifeſt from the Spherical Figure, into which a drop of Mercury forms it ſelf upon a Table; and from two of them immediately running together, as ſoon as they come to touch.

Prop. III. *Water is attracted by Glaſs.* This plainly appears from all the Experiments, that we have ſhewn upon this Subject.

Prop. IV. *Quickſilver is attracted by Glaſs.*

Experiment I. If a ſmall Globule of Quickſilver be laid upon a clean Paper, and be touched with a piece of clean Glaſs; upon drawing the Glaſs gently away, the Quickſilver will adhere to it, and be drawn away with it. And if the Glaſs be lifted up from the Paper, the Quickſilver will be taken up by it, in the ſame manner as a piece of Iron is drawn up by the Loadſtone, and will ſtick to the Glaſs by a plain Surface of a conſiderable breadth, in proportion to the bulk of the drop, as manifeſtly appears by an ordinary Microſcope. Then if the Glaſs be held a little obliquely, the drop of Mercury will roll ſlowly upon its Axis along the under ſide of the Glaſs, till it comes to the end, where it will be ſuſpended as before.

Exp. II. If a pretty large drop of Mercury be laid upon a Paper, and two pieces of Glaſs be made to touch it, one on each ſide; upon drawing the Glaſſes gently from each other, the drop of Mercury will adhere to them both, and will be viſibly drawn out from a globular to an oval Shape; the longer Axis paſſing through the middle of thoſe Surfaces, in which the drop touches the Glaſſes.

Prop. V. *The Particles of Water are more ſtrongly attracted by Glaſs, than by one another.* This manifeſtly appears from the riſing of Water in ſmall Tubes above the Level. For when the Water begins to riſe into a Capillary Tube, all the Particles of Water, which touch the ſmall *Annulus* at the bottom of the Tube, muſt have quitted the contact of the other Water, and have riſen contrary to their Gravity, to come into contact with the Glaſs. After the ſame manner the other Experiments of Dr. *Taylor*, Mr. *Hawksbee* and my ſelf, upon this Subject, are eaſily ex-

explicable. For upon a careful Examination, it will be found in them all, that ſome parts of the Water quit the contact of the other Water, and join themſelves to the Glaſs.

Prop. VI. *The Particles of Quickſilver are more ſtrongly attracted by one another, than by Glaſs.*

Experiment I. *Fig.* 5. If a ſmall Tube as *A B*, open at both ends, be dipt into a Glaſs Veſſel fill'd with Mercury, and be held cloſe to the ſide of the Veſſel, that the riſe of the Mercury within it may appear; the Mercury will partly enter into the Tube, but will ſtand within it at ſome depth, as *C E*, below the Surface of the Quickſilver in the Veſſel, *CD*; and this depth will always be reciprocally as the Diameter of the Tube.

In this Experiment a Column of Quickſilver of the height *C E* endeavours to force the Mercury higher into the Tube; and as Glaſs has been already prov'd to attract Quickſilver, the Attraction of the annular Surface on the inſide of the Tube, which is contiguous to the upper part of the Mercury, will likewiſe conſpire to farther its aſcent. What oppoſes the aſcent of the Quickſilver, is the Power, by which that part of it, which endeavours to riſe into the Glaſs, is drawn back by the Attraction of the other Mercury, with which it is in contact laterally, and this does not only balance the Attraction of the Glaſs, but likewiſe the weight of the Column of Mercury of the height *CE*, and conſequently this Attraction is conſiderably ſtronger than the Attraction of the Glaſs.

The cauſe therefore, that ſuſpends the weight of the Column of Mercury *C E*, being the difference between the Attraction of the annular Surface of the Tube at *E*, and that of an equal Surface of the Quickſilver in the Ciſtern, from which the Mercury, that endeavours to riſe into the Tube, muſt recede, in order to unite it ſelf to ſuch an annulus of the Glaſs, will always be proportional to that annular Surface, or to the Diameter of the Tube. And ſince the Column ſuſtain'd muſt be proportional to the Cauſe that ſuſpends it, that Column muſt likewiſe be as the Diameter of the Tube. But the Column ſuſpended is as the Square of the Diameter of the Tube and the height *C E* conjointly; from which it follows, that the height *C E* muſt be as the Diameter of the Tube reciprocally, as it is found to be by Experiment.

The Experiment of the Aſcent of Water above the Level in a Capillary Tube, is juſt the reverſe of this.

Exp. II. *Fig.* 6. Quickſilver being poured into the inverted Siphon *A C B*, one of whoſe Legs *A C* is narrower than the other *C B*; the height *C E*, at which the Mercury ſtands in the wider Leg *C B*, is greater than the height *C D*, at which it ſtands in the narrower Leg *C A*.

On the contrary, Water ſtands higher in the narrower Leg, than in the wider.

Exp. III. *Fig.* 7. *A B C D* repreſents a rectangular plane of Glaſs, which makes one ſide of a wooden Box. On the inſide of this is another Glaſs Plane of the ſame ſize, which at the end *A C* is preſt cloſe to the former, and opens to a ſmall Angle at the oppoſite end *B D*. When Mercury is pour'd into this Box to any height as *C E*, it inſinuates it ſelf between the two Glaſs Planes, and riſing to different heights between the Glaſſes where the opening is greater or leſs, it forms the common Hyperbola *C G F*; one of whoſe Aſymptotes *E F* is the line on which the Surface of the Mercury in the Box touches the inner Glaſs; the other is the line *A C*, in which the Planes are join'd. This Hyperbola being carefully examined by Mr. *Hawksbee* and my ſelf, the Rectangle *E H G*, whereſoever taken, proved always equal to itſelf, to as great an accuracy as could be expected, when the Planes were opened to any conſiderable Angle: But when the opening was very ſmall, the inequalities of the Planes, though the beſt I could procure, bearing a greater proportion than before to the diſtance between them, occaſioned a ſenſible Variation. Which by the way, I take to be the reaſon, why the Ordinates found by the late † Mr. *Hawksbee*, in examining the Curve produced in a contrary Situation, upon dipping two Glaſs Planes ſo join'd into Spirit of wine, do not anſwer to thoſe of the Hyperbola.

† *v. ſupr. p.* 182.

Exp. IV. *Fig.* 8. *A B* is a perpendicular Section through two Glaſs Planes join'd at *A*, and open'd to a ſmall Angle at *B*. *C* repreſents a pretty large drop of Mercury, the larger the better, which being made to deſcend as far as *C*, by holding the Planes in an erect Poſture, with the end *A* downwards, retires from the Contact of the Planes to *D*, upon inclining the Planes towards an horizontal Situation; and the diſtance *C D* becomes greater or leſs, as the Planes are more or leſs inclin'd towards the Horizon.

A drop of any oily or watery Liquor moves the contrary way, as has been ſhewn by the late † Mr. *Hawksbee*.

† *v ſupr. p.* 180.

Exp. V. *Fig.* 9. *A B* is a Tube open at both ends, and a Foot or two in length, whoſe lower part is drawn out into a fine Capillary at *B*. This Tube being fill'd with Mercury, the whole Column of Quickſilver will be ſuſtain'd in it, provided the Capillary Tube at *B* be ſufficiently ſmall. But if the Mercury in the end *B* be ſuffer'd to touch any other Mercury, it runs all out of the Tube. If, without letting it touch any other Mercury, a ſmall part of the end *B* be broken off, the Mercury will run out, till it comes to ſome leſſer height as *B C*, at which it will again ſtop, the height *B C* being nearly in a reciprocal proportion to the Diameter of the ſmall end of the Tube.

The Seventh Experiment *p.* 186. is the Reverſe of this.

Exp. VI. *Fig.* 10. Is the ſame in ſubſtance with the former, but made with a large Glaſs Funnel *A B*, inſtead of a Tube.

The Reverſe of this in Water is the thirteenth Experiment, *p.* 188.

In all theſe Experiments it is eaſily ſeen, that the Effect is owing to the difference between the two Attractions, by which Mercury tends to Glaſs and to its own Body; they being always oppoſed to one another, ſo that a particular Explication is no way neceſſary. But perhaps it may ſave ſome little trouble to the Reader, to remove the following Objection, which will readily occur to him.

In the Experiments brought to demonſtrate the fourth Propoſition, the Globule of Mercury adheres to the Glaſs in a plane Surface, which cannot be done without encreaſing the Surface of the Globule, and conſequently removing ſome of its Particles from the contact of one another. If therefore they tend more ſtrongly to one another than to the Glaſs, why do they not recede from the Glaſs, and aſſume a figure perfectly Spherical, that they may all have the greateſt poſſible contact with each other?

To this we may anſwer, that the Power by which Mercury is attracted either by Glaſs, or by other Mercury, is proportional to the attracting Surface; and therefore, though *cæteris paribus*, the tendency of Mercury to Glaſs is not ſo ſtrong as its tendency to other Mercury, yet in this Caſe a much greater number of Mercurial Particles coming into contact with the Glaſs, than what recede from the contact of one another, it is no wonder, that the Attraction of the Glaſs prevails, and cauſes the Globule to adhere to it. For the number of Mercurial Particles which loſe their contact with the other Mercury, is no more than what makes up the difference of Surface, which ariſes from changing the figure of the drop: whereas the Particles, which by this means come to adhere to the Glaſs, are all thoſe that conſtitute the plane Surface, in which the Globule touches it.

Which Conſideration ought likewiſe to be apply'd to the Suſpenſion of Quickſilver in Glaſs Tubes, either at extraordinary heights in the open Air, or at leſſer heights in a *Vacuum*, as above-mentioned. For the top of the Tube being Spherical, or nearly ſo, it will be found, that the contact of the Mercury with the extremity of the Tube, is to the contact with other Mercury, which would be gain'd by its leaving the top of the Tube and deſcending a very ſmall ſpace, in a *Ratio* infinitely great; and conſequently that the contact of the Mercury with the top of the Tube is one cauſe of its Suſpenſion.

Coroll. 1*ſt.* From this Propoſition it appears, that, in a Barometer made with a narrow Tube, the Quickſilver will never ſtand at ſo great a height as in a wider. Which accounts for the *Phænomenon* ſo often mention'd in the yearly Hiſtory of the Royal Academy of Sciences at *Paris*, by Monſ. *De la Hire*; that in the Barometer, which he conſtantly made uſe of for his annual Obſervations, the Quickſilver did not riſe ſo high, as in another he kept by him, by about three Lines and a half, which is near a third of an Inch our Meaſure: For he tells us, that the Tube of his Barometer is very ſmall. So that there is no need to have recourſe to any peculiarity either in the Quickſilver or the Glaſs of which that Tube was made; or to an unperceived remnant of Air left in the Tube, from ſome of which cauſes that Effect, and ſome others of the ſame kind were imagined to proceed.

Cor. 2d. In a Barometer made with a ſmall Tube, the Mercury will riſe and fall irregularly. For, as the height of the Mercury depends partly upon the Diameter of that part of the Tube that touches the upper Surface of the Mercury, it is plain, that the unavoidable inequalities in the Diameter of the Tube will be more conſiderable, in reſpect to the whole Diameter; and conſequently will affect the height of the Mercury more in a ſmall Tube than in a wider. And this I take to be the reaſon, why it is ſo very difficult, not to ſay impoſſible, to make two Barometers which ſhall exactly agree in the height of the Quickſilver in all Conſtitutions of the Air, eſpecially if the Tubes be very narrow. This irregularity is ſtill more conſiderable in the Pendent Barometer, in which the Quickſilver moves through a large ſpace, in order to make a ſmall Alteration in the length of the Column ſuſpended. The ſame Conſideration is eaſily extended to thoſe Levels, that depend upon the riſing of Mercury to the ſame height in the oppoſite Legs of a bent Tube; an Inſtrument of which kind has been lately offer'd for the ſervice of the Publick. And as the Effect is juſt contrary in Levels made with Water or Spirit of Wine, due regard ought to be had to this Property in the Conſtruction of thoſe Inſtruments, by making the Tubes ſufficiently wide, in order to diminiſh the Error as much as poſſible.

Of the Freezing of common Water, and purg'd of Air. by Mr. Hawksbee, *n.* 320. *p.* 304. *Plate* 5. *Fig.* 13.

LVI. 1. This Experiment was recommended to me, in order to diſcover what difference would happen in the ſwelling or bulk of Ice, producible on the Freezing of common Water, and Water purg'd of Air. Accordingly I procur'd a couple of Glaſſes, in form of Figure 13. when fill'd with the different Waters to a determinate Theſe, height, ſuppoſing at *a*, *a*, I convey'd into the Freezing Mixture, (which was nothing elſe but a Compoſition of Snow and Bay-Salt powder'd pretty fine) where they did not remain above three or four Minutes of time, before the Congelation began in each of them, which was very diſcernible, by the aſcent of the Water in their reſpective Tubes, above their firſt heights *a*, *a*; and in about an Hours time, it had aſcended in that Glaſs, which contain'd the Water purg'd of Air, at leaſt 6 Inches; but in the other Glaſs with common Water, not ſo much by more than an Inch; there being ſuch a Diſparity in the Content of the two Glaſſes, the laſt mention'd being leſs by a fifth part than the other, which contained not full four Ounces. It was obſervable, that during the Glaſſes continuance in the Frigorifick Mixture, ſmall Bubbles of Air did continually aſcend in that which was filled with common Water, but not the leaſt ſign of any ſuch appearance in the other. When I had taken them out of the premention'd Mixture, (which was at ſomething more than an Hours time from their firſt putting in) I pour'd from them the Unfrozen Water, which gave me the

Liberty of diſcovering the various forms the new made Ice had ſhot it ſelf into. That Glaſs which contain'd the purg'd Water, appearing all over the Sides and upper part of it, to the very Neck, *b b*, of divers Figures, much reſembling thoſe of Salts. The bottom part of it *c c*, diſcover'd it ſelf to be ſeemingly ſolid, but whitiſh, as if it was full of very minute interſperſt Vacuities; but not like thoſe Cavities, which are very obſervable in the Freezing of common Water; and what was very notable, at the Bottom of the other Glaſs they appear'd in great Numbers, of a longiſh Form, ſeemingly pointing all round from the Circumference to the Centre of it. There were none of thoſe premention'd Salt-like Figures on the ſides of this, as the other, but it was almoſt clear from any Adherence of Ice, ſaving towards the upper part near the Neck, where a little had faſten'd it ſelf with thoſe longiſh Bubbles, pointing from that part downwards, inclining to the Centre. From all which I cannot but conclude, that the Ice produc'd from the Water purg'd of Air, was equally augmented in its Bulk to the Quantity of Water from which it was produc'd, as that which proceeded from the frozen common Water; for had the Glaſſes been of an equal Content, I ſee no reaſon to doubt, but the Water would have been equally frozen in both, and the aſcent of the unfrozen part of them would have been much the ſame in their Tubes. But if there be any difference, the Water purg'd of Air ſeems to claim the eaſieſt Diſpoſition to be frozen.

To purge it from Air, I firſt boyl'd it well over the Fire; afterwards I included it *in Vacuo*, where it remain'd in that State till it was cold; from when I took it, and proceeded preſently on the Experiment, which on two Tryals ſucceeded alike.

Of the freezing of common Water, Ting'd with a Liquid ſaid to be extracted from Shell-Lac. *ib. p.* 304. *Fig.* 14. *Plate* 5.

2. The Liquid is a very deep Red; a ſmall quantity of which will tinge twenty times as much of common Water of a very good Sanguine colour hardly Tranſparent. I found this Liquor would not freeze; for during the coldeſt Weather we have lately had, it retain'd its Fluidity; and when it was mixt with Water, and expos'd to freeze, the Water in which it was mixt, ſoon ſuffer'd a Congelation; and ſo much of it as underwent the Change, appear'd of a fine but pale Tranſparent Red; the Body of the colour retiring into the middle, in form of the Figure *a a*, and was wholly Opake. And when no more of the mixt Liquid would be frozen, I took the Body of Ice out of the Glaſs that contain'd it, by juſt warming the ſides of it by a Fire. I found then by pricking a piece of wire into the dark part of it, the red Liquor immediately ſucceeded through the Hole I had made, ſeemingly as pure and as abſtracted from any Mixture of water, as it was before it was put into it. This red Liquor I found to be ſomething ſpecifically heavier than common water; which makes me wonder, why the Figure it made on its retiring, was not rather the reverſe to what it appear'd: For I ſhould think it reaſonable to expect, that the upper part, which was the broadeſt, ſhould, by its own Weight, alter or reverſe the Poſition of the Figure. Another thing very remarkable, was, that this

retir'd Liquid, as it ſeem'd to keep an equal diſtance from the ſides of the Glaſs, ſo did it from the bottom and top of it; which upon repeated Tryals anſwer'd the ſame.

I likewiſe mixt ſome common Water with a ſtrong purple Liquor, made from Logwood, boyl'd in Water, in which ſome Allom had been diſſolv'd. A little of this would give a ſtrong Tincture to a pretty Quantity of fair Water; and when expos'd to freeze, would retire towards the middle, leaving the firſt frozen Water of a very pale Purple, in Compariſon to the middle part; which when I had taken out of the Glaſs that contain'd it, and broke it, I found 'twas frozen through, but of ſo dark a Colour in the middle, that it came near a black.

Of the Motion of Pendulums in Vacuo, *by Mr.* Derham, *n.* 294. *p.* 1785.

LVII. In order to know, whether there be any or what difference between the Vibration of Pendulums in *Vacuo*, and the open Air. I took an Air Pump; a ſmall Movement with a Pendulum of about 10 Inches that vibrates half Seconds, and is driven by the power of a Spring; and a very well regulated Month-piece that vibrates Seconds all the Year with as much Exactneſs as moſt do.

The Reſult of many repeated Experiments, Day after Day, was, That *in Vacuo* the Vibrations were always larger, than in the Receiver unexhauſted. At the firſt, when my little Movement was newly cleaned, the Vibrations were above $\frac{3}{10}$ of an Inch larger than in the free Air. But afterwards (I ſuppoſe from ſome of the fouled Oil of the Pump ſpirtled on the Wheels, in letting in the Air, whereby the force of the Spring on the Pallets was blunted, from hence I ſay) as the Vibrations in the unexhauſted Receiver were a little contracted, ſo in the Receiver exhauſted they were more contracted, and only about 0,25 of an Inch larger than in the free Air.

The *Alteration* in *Time*, which this difference of the Vibrations produced, was conſtantly only about two Seconds in an Hour ſlower, in the Receiver exhauſted, than in it unexhauſted. For if in 4, 5 or more Hours going, the two Pendulums did not vary a quarter of a Second in the open Air, or when the Receiver was put over the little Movement, (but unexhauſted;) yet when the Receiver was exhauſted, the Half-Second Movement would loſe, at the rate of two Seconds in every Hour, in every Experiment, in many Hours going.

And becauſe I was minded to ſee what Alterations would ariſe from varying the Vibrations, therefore by opening and ſhutting the Pallets, I cauſed the Vibrations in ſome Experiments to be as large as the Receiver would bear; in others, to be as ſhort as poſſible; always adjuſting the Pendulum to vibrate Half-Seconds nicely in the Air. But ſtill the Succeſs was much the ſame, or the difference ſcarce perceptible. But only I imagined when the Pendulum vibrated but a little way from the Perpendicular, that the Vibrations *in Vacuo* were not ſo much enlarged, as when it vibrated in a larger Arch.

In all theſe Experiments (which were repeated divers times with the ſame Succeſs) I had no reaſon to move me to think, but that the Vibrations were enlarged *in Vacuo* by the vaſt Rarefaction of the *Medium*: I had I ſay no reaſon but this, That perhaps the different ſtate of the Air might alter the force of the Spring, which drove the Movement. For the tryal of this, I put a well adjuſted *Pocket-Watch* (with *Hook's* Regulator, *i. e.* the common ſmall Spiral Spring to the Ballance) into the *Vacuum.* And after ſeveral Tryals, at the ſame pitch of the Spring, I found not the leaſt Alteration in the Watches going in many Hours; neither the Springs, nor any other part of the Watch ſeeming to be in the leaſt affected by the *Vacuum*: but the Ballance circumvolving, or keeping the ſame Turns, as in the open Air.

But to be ſtill more ſure, if poſſible; it came after this into my Thoughts, to try what the Succeſs would be by putting the Half-Seconds Pendulum again into the Receiver, and only pumping out a part of the Air. And accordingly I left no more Air in, than what kept the included Mercurial Gauge at about 6 Inches height. The Event of which was, That the Vibrations were then not above $\frac{1}{10}$ Inch larger on each ſide, than in the Receiver unexhauſted: and the Time loſt, but about half a ſecond in an Hour, or $\frac{1}{4}$ at moſt. And ſo, according as the Mercurial Gauge was more or leſs high, I always found the Vibrations greater or leſſer; they gradually decreaſing, according to the quantity of Air re-admitted.

I ſhall draw ſome Inferences from what hath been ſaid,

1. What Mr. *Boyl* long ſince obſerved (from a Cock'd Piſtol going down as fiercely in his *Vacuum*, as in the Air) may be hereby farther confirmed, *viz.* That the Air is not the Cauſe of the Motion of Reſtitution in ſolid Bodies, as Springs. For if it was, it would certainly have been diſcovered in ſo tender an Inſtrument as a well adjuſted Pocket-Watch, lying under the perpetual Influence of two Springs.

2. As *in Vacuo* (where the preſſure of the Atmoſphere is taken off) Heavy Bodies deſcend quicker than they do in the open Air: So it may be obſerved, That Pendulums move ſwifter in the Receiver exhauſted, than in it unexhauſted.

That heavy Bodies deſcend quicker *in Vacuo*, is evident from the ſwift Deſcent of the leſs heavy Bodies, as *Cork*, the *Down of Sowthiſtles*, the *lighteſt Feather*, &c. which do all precipitantly deſcend, like a Stone, in a tall exhauſted Receiver.

And that the *Pendulum*, in our Experiment, moved faſter in *Vacuo*, is manifeſt from its vibrating but two Seconds in an Hour ſlower, when the Vibrations were $\frac{1}{5}$ of an Inch on a ſide, enlarged by the higheſt Rarefaction of the Air. Whereas I find by Experiment, that near the ſame encreaſe of the Vibrations doth, in the open Air, make the Pendulum go 6 or more Seconds ſlower in an Hour. I ſay *near the ſame encreaſe*, becauſe it is ſcarce poſſible to manage the Pallets ſo, as nicely to make the ſame Vibrations as were *in Vacuo*.

3. The laſt thing I ſhall deduce ſhall be by way of Query, *viz.* Whether the Variations of Pendulums obſerved under the Equinoctial, and between the Tropicks, do not ariſe as much or more from the rarity of the *Medium*, and the encreaſe of the Vibrations conſequent thereupon? It is ſcarce I think to be doubted, but that the Air is much thinner, and finer near the Line, than it is without the Tropicks. And it is evident from the Barometer, that on the tops of high Mountains the Atmoſphere gravitateth leſs than nearer the Center. And therefore (although I like the Notion of the Decreaſe of Gravity from the Encreaſe of the diſtance from the Earth's Center; I ſay, although I like this too well to diſcard it, yet) I am apt to think that this is not the only reaſon of the *Phænomenon*.

I wiſh therefore that Dr. *Halley*, when he obſerv'd at St. *Helena* his Clocks to go ſlower than in *England*, had at the ſame time obſerved whether the Vibrations were not enlarged. It might be therefore very well worth the while for ſuch as have opportunity, to take notice, Whether their Pendulums between the Tropicks do not make larger Arches than in higher Latitudes? Alſo in what Latitude they begin to alter? Whether the Vibration be greater near the Line, than in any other part between the Tropicks? Or whether the greateſt encreaſe be not always in thoſe places where the Sun paſſeth their *Zenith*? If the Vibrations be found larger under the Line, or in any other part of the Torrid Zone, then it may be obſerved, how much larger they are, and in what proportion they encreaſe, or decreaſe, by approaching nearer unto, or receding from the place of their greateſt Encreaſe?

Alſo it may be worth obſerving, Whether Pendulums do not vary on the tops of high places, or in different ſtates of the Atmoſphere, according as the *Mercury* is high or low in the Barometer? But then in this, and indeed in the former Caſes, it is neceſſary, or at leaſt very expedient, that the Movement be ſo exactly well made, that the Power, whether Weight or Spring, do at all times exert the very ſame force upon the Pads or Pallets. Which is very rarely met with. For moſt Clocks are apt to vibrate ſometimes larger, ſometimes leſſer Arches in the 24 Hours, according as the Weight or Spring doth more or leſs exert its *forces* on the Work.

An Experiment to prove an interſpers'd Vacuum by Dr. Deſaguliers, *n.* 354. *p.* 717.

LVIII. I contriv'd a Machine for the purpoſe, which conſiſted of a ſtrong wooden Frame 15 Foot high, that held the Air-Pump, and four Cylindric Glaſs-Receivers of about two Foot long each, and ſix Inches Diameter: Of theſe, having ſet the firſt upon the Air-Pump Plate, I laid on the top of it a braſs Plate of ſeven Inches Diameter, that had an oil'd Leather fix'd to it above and below, with an Hole through the middle, of between four and five Inches Diameter; then on that Plate I ſet the next Receiver, with a like Plate at top; and after the ſame manner fix'd the other two with Plates between them: The upper Receiver being a little narrower at the Neck, went into the Hole of a Board, whereby it was ſcrew'd down pretty hard on the other Glaſſes, and fix'd to the whole Machine. On the top of this upper Receiver I laid the Braſs Plate, wet Leather, and Braſs Springs which contain'd the Bodies to be dropt.

The whole Machine being fix'd, we firſt let fall a Guinea and two Papers; the one plac'd over, and the other under it, (before any Air was pump'd out) and the Guinea came to the bottom when the Papers were only in the middle of the ſecond Glaſs from the Top. Then having laid a Feather on the Braſs-Springs cloſe by the Guinea, we let them looſe both together; and the Feather was fallen only down to the 4th part of the Length of the firſt Glaſs or $\frac{1}{16}$ of the whole Diſtance, when the Guinea was got down to the bottom of the Receiver. We then laid two Papers and two Feathers, one of each under, and the other over the Guinea between the Springs; and having drawn out ſo much of the Air as to bring up the Mercury in the Gage-Tube within a quarter of an Inch of the greateſt Height to which it could be then rais'd by the Preſſure of the external Air, we caus'd the Bodies to fall all at once; And though the Papers came down to the bottom at the ſame time as the Guinea, yet the Feathers, being much lighter, wanted about three Inches. But at laſt, having laid the Papers, Feathers, and Guinea as before, we pump'd out all the Air, and then the Feathers, as well as the Papers, came to the Bottom of the Receiver at the ſame inſtant of time as the Guinea.

Cauſe of the Variation of the Barometer, from the Hiſt. Ac.Sc. *n.* 351. *p.* 570.

LIX. 1. It appears by the Barometer, that when it rains, or a little before Rain, the Air commonly becomes lighter. That it muſt rain when the Air becomes lighter it is eaſy to imagine; for the imperceivable Particles of Water, that ſwim about in the Air in prodigious Quantity, not being ſufficiently ſuſtain'd when the Air has loſt a certain Degree of its Weight, begin to fall, and ſeveral of them joining together in the Fall, make Drops of Rain. So when about half of the Air is drawn out of the Recipient of the Air-Pump, (and conſequently the remaining Air is as weak again as at firſt) ſomething like a ſmall Rain falls. But why ſhou'd the Air become lighter? One might imagine that in the Place where it rains, it may have loſt ſome of its Weight and Bulk, by means of the Winds carrying away ſome part of it: but Monſieur *Leibnitz*, in a Letter to the Abbot *Bignon*, gives a more ingenious and more new Reaſon for it.

He pretends that a Body, which is in a Liquid, weighs with that Liquid, and makes up part of its whole Weight, ſo long as it is ſuſtain'd in it; but if it ceaſes to be ſuſtain'd, and conſequently falls, its Weight no longer makes a part of the Weight of the Liquid, which thereby comes to weigh leſs. This may naturally be applied to the abovemention'd Particles of Water; they encreaſe the Weight of the Air when it ſuſtains them, which is diminiſhed when it lets them fall: and as it may often happen that the Particles of Water that are higheſt, fall a conſiderable time before they join with thoſe that are below, the Gravity of the Air diminiſhes before it rains, and the Barometer ſhews it. This new Principle of Monſieur *Leibnitz* is ſurprizing. For muſt not a ſtrange Body, whether ſuſtain'd in a Liquid or not, always weigh? Can it gravitate upon any other bottom than that which ſuſtains the whole Liquor? Does that bottom ceaſe to carry a ſtrange Body, becauſe it falls? And is not that Body, all the while it is falling, part of the ſaid Liquid as to the Weight? At that rate, whilſt a Chymical Precipitation is made, the whole Matter ought to weigh leſs, which has never been obſerved, and ſcarce appears credible.

Notwithſtanding theſe Objections the Principle holds good, when more cloſely examin'd. What ſuſtains a heavy Body is preſs'd by it. A Table, for Example, which ſuſtains a Pound Weight of Iron, is preſſed by it, and is ſo only becauſe it ſuſtains the whole Action and Effect of the Cauſe of Gravity, (whatever it be) to puſh that Lump of Iron lower. If the Table ſhou'd yield to the Action of that Cauſe of the Weight (or Gravity) it would not be preſs'd, and therefore would carry nothing. After the ſame manner the bottom of a Veſſel, which contains a Liquid, oppoſes it ſelf to all the Action of the Cauſe of Gravity againſt the ſaid Liquid: If a ſtrange Body ſwims in it, the bottom oppoſes it ſelf alſo to the ſaid Action againſt that Body, which, being in *Æquilibrio* with the Liquid, is in that reſpect really a part of it. Thus the bottom is preſs'd both by the Liquid and the ſtrange Body, and ſuſtains them both. But if the Body falls, it yields to the Action of Gravity, and conſequently the bottom does no longer ſuſtain it; neither will it ſuſtain it, till the ſaid Body is come down to the bottom. Therefore during the whole Time of the Fall, the bottom is eaſed of the Weight of that Body, which is no longer ſuſtain'd by any thing, but puſh'd down by the Cauſe of Gravity, to which nothing hinders it from yielding.

Monſieur *Leibnitz* to confirm his Notion, propoſed an Experiment. He ſays, That two Bodies muſt be tied to the two Ends of a Thread, the one heavier, and the other lighter than Water, yet ſuch as both together may ſwim in Water: Put them into a Tube full of Water, the Tube being tied to one End of the Beam of a Ballance whoſe other End has a counterpoiſing Weight: Then if we cut the Thread which ties the Bodies together (that are of unequal Weight) ſo that the heavieſt may preſently deſcend, He ſays, That in ſuch a Caſe the Tube would be no longer in *Æquilibrio*, but its counterpoiſing Weight wou'd preponderate, becauſe the bottom of the Tube wou'd be leſs preſs'd. It is plain, that the Tube muſt be ſufficiently long, that the falling Body may not reach the bottom before the Tube has time to riſe. In Chymical Precipitations, the Veſſels are either too ſhort, or what is precipitated falls ſometimes too faſt, and ſometimes too ſlow; for then the little Bodies are always (as to Senſe) *in Æquilibrio* with the Liquor that contains them.

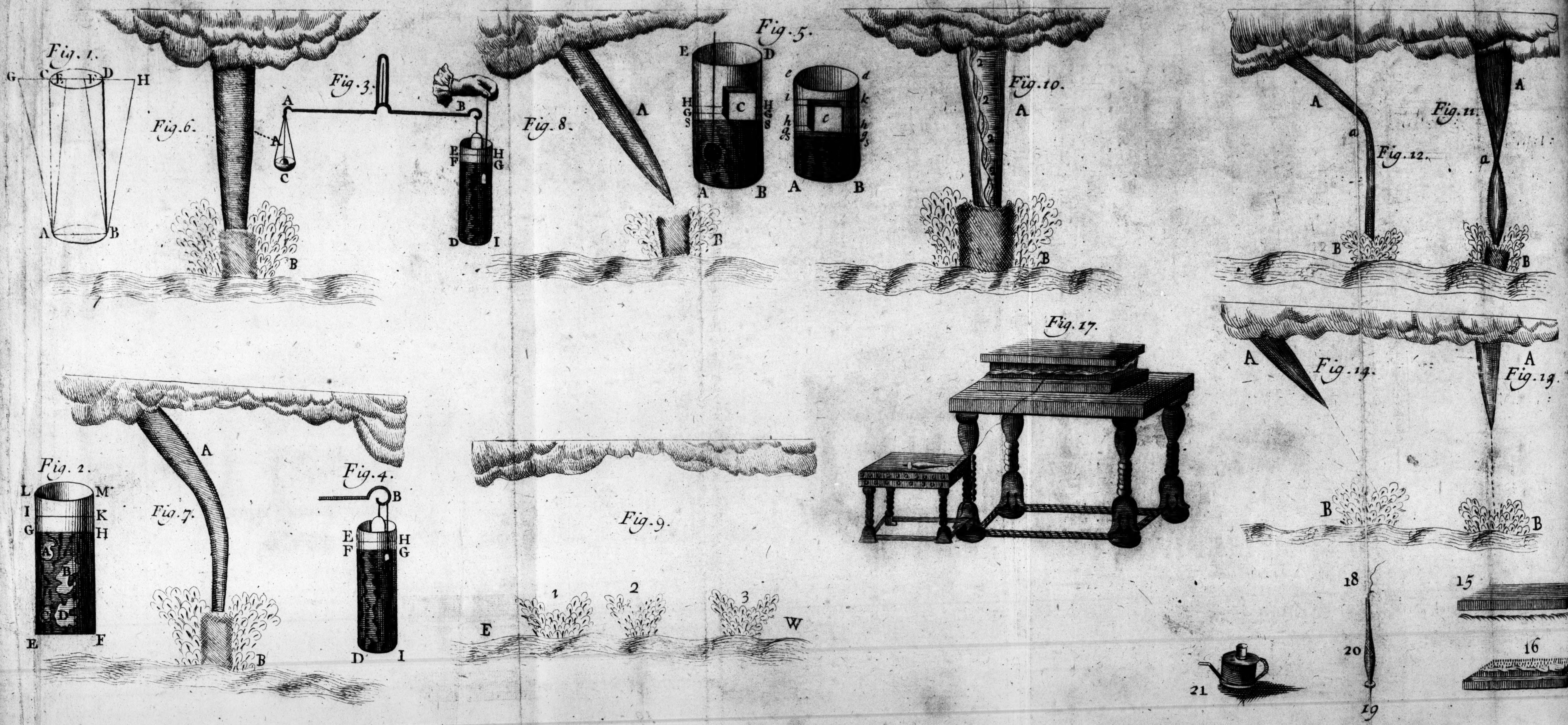


Fig. 1.
G C E F D H
A B
Fig. 6.
B
Fig. 3.
A B
A
C
E F H G
D I
Fig. 8.
A
B
Fig. 5.
E D
H G S H G S
C
A B
e d
i k
h g s h g s
c
A B
Fig. 10.
A
2 2 2 2
B
Fig. 11.
A
a
Fig. 12.
A
a
B B
Fig. 2.
L M
I K
G H
A B C D
E F
Fig. 7.
A
B
Fig. 4.
B
E F H G
D I
Fig. 9.
1 2 3
E W
Fig. 17.
Fig. 14.
A
Fig. 13.
A
B B
18
20
19
15
16
21

Monſieur *Ramazzini*, the famous Profeſſor at *Padua*, to whom Monſieur *Leibnitz* had propoſed his Experiment, has made it with Succeſs, after ſome fruitleſs Trials. Monſieur *Reaumur* (to whom the Academy had recommended it) has alſo made it with Succeſs: This is a new View in Natural Philoſophy, which, tho' it depends upon a well known Principle, is very ſubtle and far-fetch'd; and gives us juſt Reaſon to fear that in Subjects that ſeem to be exhauſted, ſeveral things may yet eſcape us.

Remarks by Dr. Deſaguliers, ib. p. 573. Plate 7.

2. *Fig.* 1. Let *A B* be the bottom of a Veſſel full of any Fluid, whoſe top is either wider than the bottom as *G E*, narrower as *E F*, or equal to it as *C D*. The Preſſure of the Fluid upon the Baſe *A B* will be equal to the Weight of *C B*, or of a Cylinder or Priſm of the ſame Fluid, made up of the Area of the Baſe multiplied into the perpendicular Height above it.

If the Fluid be equally denſe every way as Water, or of a Denſity uniformly diminiſhed as you go upwards, this Propoſition (call'd by Mr. *Boyle* the Hydroſtatical Paradox) will hold good. This is demonſtrated by all Hydroſtatical Writers.

Fig. 2. Let *E F* repreſent part of the Surface of the Earth, and *G E F H* a Pillar of the Atmoſphere, whoſe Height is *G E* the whole Height of the Air. Let us imagine the Vapours riſing out of the Earth to form themſelves into two Clouds *A* and *B*, and to ſettle in that Place where the Air is of the ſame ſpecifick Gravity with themſelves. It is evident that they will cauſe the Air to riſe ſo much higher as their Bulk amounts to, and will therefore make the Surface which was at *G H* to riſe up to *I K*, ſo that the bottom *E F*, which was preſs'd by a Pillar of Air as *G E F H*, is now preſs'd by an higher Pillar as *I E F K*. Now if the Clouds *A*, *B*, by any Cauſe ſoever, change their Place, ſo as to come downwards, (for *Example* to *C*, *D*) the Height of the Pillar *I E F K* will remain the ſame as it was, and therefore the bottom *E F* will be preſs'd as before: by the foregoing Propoſition.

Cor. I. If the Clouds *A*, *B* deſcend, and in their Deſcent keep the ſame Bulk as they had before, the Surface *I K* will remain the ſame, and therefore *E F* will be preſs'd as before.

Cor. II. Whether a Body be ſpecifically lighter or ſpecifically heavier than a Fluid; ſo long as it is detain'd in it, it will add to the Fluid as much Weight as the Weight of an equal Bulk of that Fluid: wherefore a Body does not loſe all that Weight which it added to the whole Weight of the Fluid, when it ceaſes to be ſuſtain'd in the ſaid Fluid: contrary to Monſieur *Leibnitz*'s Principle.

Scholium. If a Cloud (by any Cauſe whatſoever) becomes ſpecifically heavier than that Part of the Air in which it ſwims, the Exceſs of its Gravity above an equal Bulk of Air will make it deſcend, and accelerate its motion downwards; and then indeed it will loſe of its weight by the Reſiſtance of the *Medium*, till it comes to an uniform (or ſenſibly uniform) Motion: but all the Weight that it will loſe, will only be the

Exceſs of its Gravity above that of the Air; for with the reſt of its Weight it will ſtill make up part of the Weight of the Air.

Exp. I. *Fig.* 3. Having with a Weight in the Scale *C* of the Balance *A B* counterpois'd the long Glaſs of Water *E I*, with a Horſe-Hair I let down the leaden Weight *W* into the Water, which from *F G* aroſe up to *E H*; and therefore the Water became heavier by the Weight of a Bulk of Water equal to the Lead. Having with another Weight in *C* made up the Counterpoiſe to the whole, with fine Sciſſars I cut the Thread of the Plummet; and all the while the Plummet was falling, the Water deſcended rather than roſe; and when the Lead was at the bottom, the Water overpois'd, becauſe it had then added to it all the Exceſs of Weight of the Lead above an equal Bulk of Water, which by Experiment is about $\frac{10}{11}$ of its Weight. Had Meſſieurs *Reaumur* and *Ramazzini* tri'd the Experiment thus, the Succeſs had been the ſame; but Mr. *Ramazzini* (as I underſtood from a Gentleman who was preſent) tried it in the following Manner, as I have ſince done.

Exp. II. *Fig.* 4. Making uſe of the abovemention'd Machine, after I had balanc'd the Water and Lead in it, I fix'd to the End of the Beam *B* the Thread of the Plummet, which in the former Experiment I held in my Hand. This added to the Weight hanging at *B*, and oblig'd me to put into the other Scale a Weight equal to $\frac{10}{11}$ of the Lead, to recover the *Æquilibrium*. Then cutting the Thread or Hair, the Scale with the Weights overpois'd whilſt the Lead was falling; but the *Æquilibrium* was reſtor'd when it came to the bottom. So that the Lead even then muſt have loſt only its Exceſs of Weight above Water.

Exp. III. *Fig.* 5. I tried the Way propoſed by Monſieur *Leibnitz* in the following Manner.

I took a Cork *C* weighing an Ounce, and ſomething more than four times lighter than an equal Bulk of Water, and a Ball of Antimony *W* about four times ſpecifically heavier than Water, and of four Ounces Weight. The Cork laid upon the Water in the Veſſel *E A B D* rais'd the Water from *S S* to *G G*, and added an Ounce to the Weight of the whole Water: then ſuſpending the Ball of Antimony by a String, and letting it hang in the Water at *N*, it rais'd the Water from *G G* to *HH*, and ſo added another Ounce to the weight of the water. Then tying the Antimony to the Cork. (See the Figure of the Veſſel mark'd with little Letters) the Cork had added to it three Quarters of the weight of Antimony which the Hand before had ſuſtain'd, and made it ſink ſo as to be almoſt cover'd, and raiſed the water to *i k*, adding three Ounces to its weight. Hanging this Veſſel of water upon the Balance, and a Counterpoiſe at the other End, upon cutting the String, the Veſſel of water was rais'd up, and the *Æquilibrium* was not reſtor'd till the Antimony came to the bottom.

By obſerving that as the Cork (being freed from the weight of the Antimony) aroſe, and that during the Fall of the Body, the water ſunk to *h h*, it appears that this is, in effect, the ſame Experiment as the former and concludes no more. As to the real Cauſe of the Variation of the Barometer, namely, the Accumulation of the Air by Winds over the Place where the Barometer riſes; and part of the Air being blown away where the Mercury in the Barometer ſinks, ſee *Phil. Tranſ.* N. 181.

v. Abr. Vol. II. p. 20.

In making the firſt Experiment before the *Royal Society*, of a piece of Lead ſuſpended by a Thread, whilſt it was wholly cover'd with Water in the large Tube in which it hung (whoſe Length was 4 Feet) it was obſervable, not only that the End of the Balance (to which the Tube of Water with the Lead in it was fix'd) did not riſe when the Thread was cut, (to let the Lead fall from the top to the bottom of the Tube) as it muſt have done according to Mr. *Leibnitz*'s Principle; but that the ſaid End of the Balance began to deſcend from the Time that the Lead began to fall. Therefore to be ſure that it was not the Plummets rubbing againſt the Sides of the Tube in its Fall, which cauſed that *Phænomenon*, I hung to the Balance a long Glaſs of three Inches diameter inſtead of the Tube, and making the Experiment as before, it ſucceeded in the ſame manner: the End of the Balance which carried the Veſſel of Water ſunk as ſoon as the Thread of the Plummet was cut; though this Glaſs was not above half ſo long as the Tube. When by holding the String I drew the Lead upwards end downwards in the Water, there was no ſenſible Alteration of the *Æquilibrium*. Neither was it alter'd by cutting the String of a Stone-Plummet, becauſe of the Shortneſs of the Glaſs, and the little Exceſs of ſpecifick Gravity in the Stone: for the greater the Difference is betwixt the Body made uſe of in this Experiment and Water, as well as the bigger the Body it ſelf is, the better the Experiment will ſucceed.

Hence it appears, that when a Body, ſpecifically heavier than a Fluid, is (by what cauſe ſoever) detain'd in any Place of the ſaid Fluid, it adds as much to the Weight of the whole Fluid, as an equal Bulk of the ſaid Fluid amounts to: And when the ſaid Body, by the Action of its Exceſs of ſpecifick Gravity above the Fluid, deſcends with an accelerated Motion; ſo long as that Motion is accelerated, the Reſiſtance of the Fluid (which is as the Square of the Velocity) takes off ſomething of the whole Weight of the Body; but as much as the Body loſes, ſo much the Water gains, over and above what was given it by its riſing on Account of the immers'd Body. A Body therefore that falls in a Fluid is ſo far from making the Fluid lighter as it falls, that it makes it preſs more upon the Bottom that ſuſtains it, when it is falling, than when it was at reſt in the Fluid.

If the Veſſel of Water be long enough for the falling Body to come to an uniform Motion before it reaches the bottom, the Force impreſs'd on the Water under the Body will make it preſs the bottom, as much as if the Body were actually at bottom; the Body in that Caſe loſing all its Exceſs of Gravity above that of the Water, and the Water gaining it. Hence it follows, That a falling Cloud, when it comes to an uniform Motion, will not only add to the Weight of the Air as much as the

Weight of an equal Bulk of Air; but even as much as its whole Weight amounts to, though it be ſpecifically heavier than the Air about it.

All the Diminution of Weight that can be allow'd in this Caſe is this. If we imagine the Air to have a ſmooth, regular Surface as we have at firſt ſuppoſed, (or if that be not allow'd, we may take any imaginary Surface of it above the Clouds) when a falling Cloud is diminiſh'd in Bulk, (as when it is chang'd into Rain) the Surface of the Air will ſubſide in proportion to that Diminution, and therefore will weigh leſs, by ſo much as is the Weight of a Quantity of Air equal to the bulk that Cloud has loſt: But when the Drops of Rain after their Acceleration (occaſioned by their Exceſs of Gravity above that of the Air) are come to an uniform Motion by the Reſiſtance of the Air, they reſtore to the Air the Weight that it had loſt. Now this uniform Motion being acquir'd in about two Seconds of Time, and the Diminution of Gravity in the Air being inſenſible, when compared to near three Inches of Mercury (for ſuch is the Variation of the Barometer with us) can no way be the occaſion of thoſe ſo ſenſible Alterations in it, which happen ſome time before Rain or fair Weather. Add to this that the whole Quantity of Rain that falls in *England* and *France*, in the ſpace of one Year, ſcarce ever equals two Inches of *Mercury*: And in moſt Places between the Tropicks, the Rains fall, and at certain Seaſons, in very great Quantities, and yet the Barometer ſhews there very little or no Alteration.

LX. *Papers omitted.*

The following Papers which are printed by Mr. *Hawksbee* in his *Phyſico-Mechanical Experiments.*

n. 292. *p.* 1629. 1. An Experiment to ſhew the Cauſe of the Deſcent of the Mercury in a Barometer in a Storm.

n. 295. *p.* 1806. 2. An Experiment of firing Gun-powder on a red hot Iron in *Vacuo Boyliano.*

ib. p. 1807. 3. An Experiment of the Qualities of Air produc'd from Gun-powder fir'd in *Vacuo Boyliano.*

n. 296. *p.* 1865. 4. Experiments on the Production of Light from the *Phoſphorus* in *Vacuo.*

n. 297. *p.* 1902. 5. An Experiment on the Propagation of Sound in condens'd Air, with a Repetition of it in the open Field.

ib. p. 1904. 6. An Experiment of the Diminution of Sound in Air rarify'd.

n. 298. *p.* 1946. 7. Experiments on the Reſilition of Bodies in condens'd Air, common Air and in *Vacuo.*

ib. p. 1948. 8. An Experiment on the Deſcent of Malt Duſt in an evacuated Receiver.

n. 303. *p.* 2129. 9. Several Experiments on the Mercurial Phoſphorus.

n. 304. *p.* 2165. 10. ——— On the Attrition of Bodies in *Vacuo.*

11. An Experiment touching the Proportion of the Weight of Air, *n.*305.*p.*2221.
to the weight of a like Bulk of Water, without knowing the Quantity
of either.

12. An Experiment ſhewing that the Spontaneous Aſcenſion of Water *ib. p.* 2223.
in ſmall Tubes open at both ends, is the ſame in *Vacuo*, as in the open
Air.

13. Several Experiments touching the ſeeming ſpontaneous aſcent of *n.* 319.*p.*258.
Water.

14. An Experiment made and repeated, touching the Production of *n.*307.*p.*2277.
conſiderable Light on a ſlight Attrition of the Hands on a Glaſs-Globe
exhauſted of Air; with other remarkable Occurrences.

15. An Experiment touching the extraordinary Electricity of Glaſs, *n.*308 *p.*2327.
producible on a ſmart Attrition of it; with a Continuation of Experiments on the ſame Subject, and other Phænomena.

16. Several Experiments ſhewing the ſtrange Effects of the Effluvia *n.*309.*p.*2372.
of Glaſs, producible on the Motion and Attrition of it.

17. An Experiment confirming one lately made of the Production of *n.*310.*p.*2413.
Light by the Effluvia of one Glaſs falling on another in Motion.

18. An Experiment of the Difficulty of ſeparating two Hemiſpheres, *ib. p.* 2415.
upon injecting an Atmoſphere of Air on their outward Surfaces, without withdrawing the included Air.

19. An Experiment of the Quantity of Air produc'd from a certain *n.*311.*p.*2409.
Quantity of Gun-powder fir'd in common Air.

20. An Experiment ſhewing that the Springs or conſtituent parts of *ib. p.* 2412.
Air are capable to ſuffer ſuch Diſorder by a violent impulſe, as to require Time to recover their natural State.

21. The Repetition of an Experiment touching Motion given Bodies *n.* 315. *p.* 82.
included in a Glaſs by the approach of a Finger near its outſide; with
other Experiments on the Effluvia of Glaſs.

22. An account of ſome Experiments touching the Electricity and *ib. p.* 87.
Light producible on the Attrition of ſeveral Bodies.

23. An Experiment touching the different Denſity of the Air, from *ib. p.* 93.
the greateſt natural Heat to the greateſt natural Cold in this Climate.

24. An account of the Succeſs of an Attempt, to continue ſeveral
Atmoſpheres of Air condens'd in the ſpace of one for a conſiderable *n.* 318.*p* .217.
time.

25. An Experiment of the Production of Light within a Globe Glaſs,
whoſe inward Surface is lin'd with Sealing-Wax, upon an Attrition of *ib. p.* 219.
its outſide.

LXI. *An Account of a Book, Omitted.*

1. *Edm. Dickenſoni*, M.D. Phyſica vetus & nova vera, ſive Tractatus *n.*277.*p.*1083.
de naturali veritate Hexameri Moſaici, per quem probatur in Hiſtoria
Creationis

Creationis, cum generationis Univerſæ methodum atque modum, tum veræ Philoſophiæ Principia ſtrictim atque breviter tradi, 4to. *Lond.* 1702.

CHAP. II.

Hydrology.

1. *Of the Cauſe of the Saltneſs of the Ocean, by Dr.* Halley, *n.* 344. *p.* 296.

THere have been many Attempts made and Propoſals offered, to aſcertain from the Appearances of Nature, what may have been the Antiquity of this Globe of *Earth*; on which, by the Evidence of Sacred Writ, *Mankind* has dwelt about 6000 Years; or according to the *Septuagint* above 7000. But whereas we are there told that the Formation of *Man* was the laſt Act of the *Creator*, 'tis no where revealed in Scripture how long the *Earth* had exiſted before this laſt Creation, nor how long thoſe five Days that preceeded it may be to be accounted; ſince we are elſewhere told, that in reſpect of the Almighty a thouſand Years is as one Day, being equally no part of *Eternity*: Nor can it well be conceived how thoſe Days ſhould be to be underſtood of natural Days, ſince they are mentioned as Meaſures of Time before the Creation of the Sun, which was not till the fourth Day. And 'tis certain *Adam* found the *Earth*, at his firſt Production, fully repleniſhed with all ſorts of other *Animals*. This Enquiry ſeeming to me well to deſerve Conſideration, and worthy the Thoughts of the *Royal Society*, I ſhall take leave to propoſe an Expedient for determining the Age of the World by a *Medium*, as I take it, wholly new, and which in my opinion ſeems to promiſe Succeſs, though the Event cannot be judged of till after a long Period of Time; ſubmitting the ſame to their better Judgment. What ſuggeſted this *Notion* was an Obſervation I had made, that all the *Lakes* in the *World*, properly ſo called, are found to be *Salt*, ſome more ſome leſs than the Ocean Sea, which in the preſent Caſe may alſo be eſteem'd a *Lake*; ſince by that term I mean ſuch ſtanding Waters as perpetually receive Rivers running into them, and have no Exit or Evacuation.

The Number of theſe Lakes in the known Parts of the World is exceeding ſmall, and indeed upon Enquiry I cannot be certain there are in all any more than four or five, *viz.* Firſt, The *Caſpian Sea*; Secondly, The *Mare Mortuum* or *Lacus Aſphaltites*; Thirdly, The Lake on which ſtands the City of *Mexico*; and Fourthly, The Lake of *Titicaca* in *Peru*, which by a Channel of about fifty Leagues communicates with a fifth and ſmaller, call'd the Lake of *Paria*, neither of which have any other Exit. Of theſe the *Caſpian*, which is by much the greateſt, is reported to be ſomewhat leſs ſalt than the Ocean. The *Lacus Aſphaltites* is ſo exceedingly Salt, that its Waters ſeem fully ſated, or ſcarce capable to diſſolve any more; whence in Summer time its Banks are incruſtated with great Quantities of dry *Salt*, of ſomewhat a more pungent nature than the *Marine*, as having a Reliſh of *Sal Armoniac*; as I was inform'd by a curious Gentleman that was upon the place.

The *Lake* of *Mexico* properly ſpeaking is two Lakes, divided by the *Cauſways* that lead to the *City*, which is built in Iſlands in the midſt of the *Lake*, undoubtedly for its Security; after the Idea, 'tis probable, its firſt Founders borrowed from their *Beavers*, who build their Houſes on Damms they make in the Rivers after that manner. Now that part of the *Lake* which is to the Northwards of the *Town* and *Cauſways*, receives a River of a conſiderable Magnitude, which being ſomewhat higher than the other, does with a ſmall Fall exonerate it ſelf in the Southern part, which is lower. Of theſe the lower is found to be ſalt, but to what degree I cannot yet learn; though the upper be almoſt freſh.

And the Lake of *Titicaca*, being near eighty Leagues in Circumference, and receiving ſeveral conſiderable freſh Rivers, has its Waters, by the Teſtimony of *Herrera* and *Acoſta*, ſo brackiſh as not to be potable, though not fully ſo ſalt as that of the Ocean; and the like they affirm of that of *Paria*, into which the Lake of *Titicaca* does in part exonerate it ſelf, and which I doubt not will be found much ſalter than it, if it were enquired into.

Now I conceive that as all theſe Lakes do receive Rivers and have no Exite or Diſcharge, ſo 'twill be neceſſary that their Waters riſe and cover the Land until ſuch time as their Surfaces are ſufficiently extended, ſo as to exhale in Vapour that Water that is poured in by the Rivers; and conſequently that Lakes muſt be bigger or leſſer according to the Quantity of the freſh Water they receive. But the Vapours thus exhaled are perfectly freſh, ſo that the ſaline Particles that are brought in by the Rivers remain behind, whilſt the freſh evaporates; and hence 'tis evident that the Salt in the Lakes will be continually augmented, and the Water grow ſalter and ſalter. But in Lakes that have an Exit, as the Lake of *Geneſaret*, otherwiſe call'd that of *Tiberias*, and the upper Lake of *Mexico*, and indeed in moſt others, the Water being continually running off, is ſupply'd by new freſh River Water, in which the ſaline Particles are ſo few as by no means to be perceived.

Now if this be the true Reaſon of the Saltneſs of theſe Lakes, 'tis not improbable but that the Ocean it ſelf is become ſalt from the ſame Cauſe, and we are thereby furniſhed with an Argument for eſtimating the Duration of all Things from an Obſervation of the Increment of Saltneſs in their Waters. For if it be obſerved what Quantity of Salt is at preſent contained in a certain Weight of the Water of the *Caſpian Sea*, for example, taken at a certain Place, in the dryeſt Weather; and after ſome Centuries of Years the ſame Weight of Water, taken in the ſame place and under the ſame Circumſtances, be found to contain a ſenſibly greater Quantity of Salt than at the time of the firſt Experiment, we may by the Rule of Proportion, take an eſtimate of the whole time wherein the Water would acquire the Degree of Saltneſs we at preſent find in it.

And this Argument would be the more concluſive, if by a like Experiment a ſimilar Encreaſe in the Saltneſs of the *Ocean* ſhould be obſerv'd: for that, after the ſame manner as aforeſaid, receives innumerable Rivers, all which depoſite their ſaline Particles therein; and are again ſupply'd, as I have elſewhere ſhewn, by the *Vapours* of the *Ocean*, which riſe therefrom in Atoms of pure Water, without the leaſt admixture of Salt. But the Rivers in their long Paſſage over the Earth do imbibe ſome of the ſaline Particles thereof, though in ſo ſmall a Quantity as not to be perceived, unleſs in theſe their Depoſitories after a long Tract of Time. And if upon repeating the Experiment, after another equal number of Ages, it ſhall be found that the Saltneſs is further encreaſed with the ſame Increment as before, then what is now propoſed as *Hypothetical* would appear little leſs than *Demonſtrative*. But ſince this Argument can be of no uſe to ourſelves, it requiring very great Intervals of time to come to our Concluſion, it were to be wiſhed that the ancient *Greek* and *Latin* Authors had delivered down to us the degree of the Saltneſs of the Sea, as it was about 2000 Years ago: for then it cannot be doubted but that the Difference between what is now found and what then was, would become very ſenſible. I recommend it therefore to the Society, as Opportunity ſhall offer, to procure the Experiments to be made of the preſent degree of Saltneſs of the Ocean, and of as many of theſe Lakes as can be come at, that they may ſtand upon Record for the benefit of future Ages.

If it be objected that the Water of the Ocean, and perhaps of ſome of theſe Lakes, might at the firſt Beginning of Things, in ſome meaſure contain Salt, ſo as to diſturb the Proportionality of the Encreaſe of Saltneſs in them, I will not diſpute it: but ſhall obſerve that ſuch a Suppoſition would by ſo much contract the Age of the World, within the Date to be derived from the foregoing Argument, which is chiefly intended to refute the ancient Notion, ſome have of late entertain'd, of the Eternity of all Things; though perhaps by it the World may be found much older than many have hitherto imagined.

A Water-Spout in the Downs, *by Mr.* Gordon, *n.* 270. *p.* 805.

II. The latter end of *March*, 1701. *mane*; between the Hours of 10 and 11, I obſerved a remarkable *Water-Spout* in the *Downs*. It bore bore N. by E. off our Ship, about 2 Leagues diſtance by Eſtimation; the Wind at E. N E. a Top-ſail gale, and very Cold. The Horizon was intirely open and ſerene, except the Northern parts thereof from N. N. W. to N. E. by E. or thereabouts. The higheſt part of the Cloud appeared to make an Angle of 45 Deg. of Elevation. About one half of the Cloud, (*viz.* the upper) was very white, and the other extreamly black. The Spout itſelf, (which hung from the lower part of the whitiſh Cloud) hovered up and down for about 20 Minutes, and during two or three Minutes of the time, that part of the Sea exactly under the Spout, did ſparkle up Water to a conſiderable height. The ſparkling run along to the Leeward, (the Cone of the Spout moving that way, and making it ſeems a diſcharge, though not viſible to us in its fall) and continued running along for ſix Ships length. Afterwards the body of the Spout did quickly contract it ſelf, and then diſappeared. About two Hours afterwards the Heavens were intirely overcaſt, and during that Afternoon there fell abundance of Hail, and both Wind and Cold encreaſed. I have ſeen ſeveral Water-Spouts in the *Mediterranean Sea* ſome Years ago, and thoſe uſually during the time of ſtark Calm and hot Summer Weather; but to ſee one in our Northern Climate at this time of the Year, and during Weather both cold and windy, is, I preſume, a little unuſual.

Spouts in the Mediterranean, *by Mr.* Alex. Stuart, *n.*277. *p.* 1077.

III. The 27th of *Auguſt*, 1701. being upon the Coaſt of *Barbary*, to the Northward of the Town of *Bona*, upwards of 10 Leagues diſtance at Sea, about 7 a Clock at Night, ſhortly after Sun-ſetting appeared in the N. E. (which was directly up the Gulf of *Lyons* from us) great and continued Flaſhes of Lightning one after another, without hardly any Intermiſſion, and this without Thunder continued till the next Morning; the Flaſhes of Lightning ſometimes repreſenting the ſudden Appearance of a Star, and at other times of a Flaming Sword, and again of a Silver Cord ſtretched along the Clouds, or as the irregular Rents of a Vial from top to bottom. About 8 next Morning we had Thundring, with a Continuation of Lightning of the kind and appearance above-mention'd, all from the N. E. or thereby. About 9, fell down from the Clouds (which lookt diſmally black, lowring, and as it were heavy with Rain) in the ſaid N. E. Quarter, three Waterſpouts (as commonly called) that in the middle being the greateſt ſeem'd ſo big as the Maſt of a Ship, and I judged it to be at leaſt a League and a half diſtant from us; ſo that in it ſelf no doubt it was bigger than three Maſts. The other two were not by half ſo big. All of them black, as the Cloud from whence they fell. All of them ſmooth, without any knot or irregularity; only at firſt falling, ſome fell perpendicularly down, and ſome obliquely, and all of them ſmaller at the lower end than above, giving the repreſentation of a Sword; ſometimes alſo one of them would bow it ſelf, and again become ſtrait, and alſo ſometimes became ſmaller, and again increaſed its bulk; ſometimes it would diſappear, and immediately fall down again; ſometimes it became extenuated to the ſmallneſs of a Rope, and again became groſs as before.

There was always a great boyling and flying up of the Water of the Sea, as in a *Jette d' eau*, or Water-work; or this riſing of the Water had the appearance of a ſmoaking Chimney in a calm Day. Some Yards above the ſurface of the Sea the Water ſtood as a Column or Pillar and then ſpread it ſelf, and was diſſipated as Smoak: And the Sword like Spout from the Clouds either came down to the very middle of this

Pillar, and as it had been joyned with it, as the greateſt, which fell perpendicularly down, ſtill did from beginning to end: Or elſe it pointed to this Column of Water, at ſome diſtance, either in a perpendicular or oblique Line, as did the other two leſſer. There were three or four Spouts more, which appeared at the ſame time in the ſame quarter of the Heavens, but neither for bulk or duration like to theſe three: Thoſe appeared or diſappeared ſeveral times, during the Continuance of theſe three aforeſaid.

It was hardly diſtinguiſhable whether the Sword like Spout fell firſt down from the Cloud, or the Pillar of Water roſe firſt from the Sea, both appearing oppoſite to one another all of the ſudden, as in the twinkling of an Eye. Only I obſerved of one, that the Water boyled up from the Sea to a great height, without the leaſt appearance of a Spout pointing to it either perpendicularly or obliquely, and here the Water of the Sea never came together in the form of a Pillar or a Column, but did fly up ſcatteredly, the Sea being in a boyling rage round the place. The Wind being then NE. the ſaid Boyling advanced towards the S. W. as a flitting or moving Buſh upon the ſurface of the Sea, and at laſt ceaſed. This proves that the boyling or flying up of the Water of the Sea may begin before the Spout from the Cloud appears to us: and indeed if there be any ſmall matter of priority betwixt thoſe two Appearances, the boyling or throwing up of the Sea-Water has it: Which begins firſt to boyl, and then frames it ſelf into a Pillar of Water, eſpecially on the lower part thereof.

It was obſervable of all of them, but more perceptible of the great one, that towards the end it began to appear like a hollow Canal, only black in the Borders, but white in the middle; and though at firſt it was altogether black and opaque, yet one could very diſtinctly perceive the Sea Water to fly up alongſt the middle of this Canal, as Smoak up a Chimney, and that with great Swiftneſs, and very perceptible Motion: And then ſhortly after the Spout or Canal brake in the middle, and diſappeared by little and little, the boyling up, yea, the Pillar-like form of the Sea-Water continuing ſtill the laſt, yea, for ſome conſiderable time after the Spout diſappeared, and perhaps till the Spout appear'd again, or reformed it ſelf, which it commonly did in the ſame place as before, breaking and forming it ſelf again ſeveral times in a quarter of an Hour, or half an Hours time. The middle of the three, as I have ſaid, exceeded all the reſt in Bigneſs, Perpendicularity, Conſtancy of Form and Situation, as well as Duration; but at laſt vaniſhed, as is above ſet down.

It was obſervable (which I had almoſt forgot) That the oblique Spouts pointed always from the Wind; that is, That the Wind being at N. E. the oblique Spouts always pointed to the S. W. tho' at the ſame time and moment there were others perpendicular, which remained ſtill ſo, notwithſtanding the Wind. Alſo that ſuch as were curved had ſtill the Convex ſide from the Wind, and the Concave towards it; that is, the Wind being at N. E. the Concave was towards the N. E. and the Convex towards the S. W. It rained a great deal during the Continuance of theſe Spouts, and after their total Diſappearance we had half an Hours violent Gale of Wind from the N.E. with very little Rain, thereafter the Weather cleared up.

The Explication of the Tables. Plate 7.

Fig. 6. *A* the Spout of a black Colour, falling out of a black Cloud perpendicularly. *B* the Water of the Sea, riſing in the Form of a Pillar or Column in the middle, and ſcattered round about the ſaid middle Column, in form of Smoak, or rather like the falling of a *Jette d' eau.* Theſe two meet one another directly, and the Column of Water from the Sea is commonly groſſer than the Spout from the Clouds. *Fig.* 7. *A* a curved Spout, joining with the riſing Water of the Sea at *B*. *Fig.* 8. *A* repreſents a black Spout, falling obliquely from the Clouds of the ſame colour. *B* repreſents the aſcending Column of the Sea-Water as in *Fig.* 6. with this Difference that here the Spout and Column of Water meet not. *Fig.* 9. *E* and *W* ſignify *Eaſt* and *Weſt*. 1,2,3. repreſent the ſucceſſive Progreſſion of the boyling of the Sea from *Eaſt* to *Weſt*, or from N. E. to S. W. and that without any appearance of a Spout from the Clouds, pointing to either of theſe Places. *Fig.* 10. *A* repreſents the big perpendicular Spout a little before its breaking, white in the middle. *B* the Column of Sea Water joining therewith. 2 2 2 2. the Water of the Sea, aſcending in the form of Smoak up a Chimney, all alongſt the Column at *B* to the Clouds. *Fig.* 11. *A* the breaking of a perpendicular Spout, commonly beginning in the middle at *A*. *B* the Riſe of the Sea Water, which begins to fail, and the middle Column to diſappear. *Fig.* 12. *A* an oblique Spout, which after reaching to the Sea in a Curved Line or Obtuſe Angle, does ſhortly after break at *a*, and diſappears. *B* the riſing of the Sea Water alſo beginning to ceaſe. *Fig.* 13. *A* a perpendicular Spout beginning to fall. *B* the beginning aſcent of the Water of the Sea under it. *Fig.* 14. *A* One oblique Spout, beginning or darting it ſelf out of the Clouds. *B* the riſing or boyling of the Water, anſwering to it in an oblique Line.

Theſe ſometimes reach down to the Sea or riſing Water, and ſometimes they do not reach thither, but continue a while as here repreſented.

A Spout in Yorkſhire, *by Mr.* Dela Pryme, *n.*281. *p.* 1248.

IV. *Auguſt* 15. 1687. about two in the Afternoon, appear'd a Spout in the Air, in the Pariſh of *Hatfield*; on the noiſe of which I immediately run to the View thereof, and found it about a Mile off, coming directly to the Place where I was.

The Seaſon was very dry, the Weather extreme hot, and the Air very Cloudy, the Wind aloft and pretty ſtrong; and (which is moſt obſervable and material) blowing out of ſeveral Quarters at the ſame time and filling the Air hereabout with mighty thick and black Clouds, Layer upon Layer: The Wind thus blowing created a great Vortex, Gyration and whirling among the Clouds, the Center of which every now and then dropt down in the Shape of a long thin black Pipe, commonly call'd a Spout; in which I could diſtinctly behold a Motion, like that of a Screw, continually drawing upwards, and ſcrewing up, as it were, where-ever it touch'd. In its Progreſs it mov'd ſlowly over a Hedge Row and Grove of young Trees, which it made bend like Hazle Wands, in a circular Motion; then going forward to a great Barn, it did in a Minute twitch off all the Thatch, and fill the whole Air therewith. Coming to a very great Oak Tree, it made it bend like the aforegoing, and broke one of the greateſt and ſtrongeſt Branches thereof, that would not yield to its Fury, and twiſting it about, flung it a very conſiderable diſtance off. Then coming within 300 Yards of me, I beheld with great Satisfaction its odd Phænomenon, and found it proceeded from nothing but a Gyration of the Clouds, by contrary Winds, meeting in a Point or Center, and then and there where the greateſt Condenſation and Gravitation was, falling down into a Pipe or great Tube, (ſomewhat like the *Cochlea Archimedis*) and that in its working or whirling Motion, either ſucks up Water, or deſtroys Ships, &c. Having travelled about ¼ of a Mile farther, it then diſſolv'd by the prevalency of the Wind that came out of the *Eaſt*.

Another, by the ſame, n. 284. p. 1331.

V. Since this I have been ſo happy as to ſee another in the ſame place. The Weather here in this part of the Country, hath been exceeding wet and cool, yet for all that *Monday* the 21ſt of *June* was pretty warm; on the Afternoon of which Day, about two of the Clock, no Wind ſtirring below, tho' it was ſomewhat great in the Air, the Clouds begun to be mightily agitated and driven together; whereupon they became very black and were (moſt viſibly) hurried round, from whence proceeded a moſt audible whirling noiſe, like that commonly heard in a Mill. After a while a long Tube or Spout came down from the Center of the congregated Clouds, in which was a ſwift ſpiral Motion like that of a Screw, or the *Cochlea Archimedis* when it is in Motion, by which ſpiral nature and ſwift turning, Water aſcends up in to the one as well as into the other. It travelled ſlowly from Weſt to North Eaſt, broke down a great Oak-Tree or two, frighted the Weeders out of the Field, and made others lie down flat upon their Bellies, to ſave being whirl'd about and killed by it, as they ſaw many Jackdaws to be that were ſuddenly catched up, carried out of ſight, and then caſt a great way off amongſt the Corn; at laſt it paſs'd over the Town of *Hatfield*, to the great terror of the Inhabitants, filling the whole Air with the Thatch that it pluck'd off from ſome of the Houſes; then touching upon a corner of the Church, it tore up ſeveral Sheets of Lead, and roll'd them ſtrangely together, ſoon after which, it diſſolv'd and vaniſh'd without doing any further Miſchief.

There was nothing more extraordinary in this, than in the other that I gave you a former account of, and by all the Obſervations that I could make of both of them, I found that had they been at Sea, and joyn'd to the ſurface thereof, they would have carried a vaſt quantity of Water up into the Clouds, and the Tubes would then have become much more ſtrong and opake than they were, and have continued much longer. It is commonly ſaid that at Sea the Water collects and bubbles up a Foot or two high under theſe Spouts before that they be joyned: But the Miſtake lies in the pellucidity and fineneſs of thoſe Pipes, which do moſt certainly touch the ſurface of the Sea before that any conſiderable Motion be made in it, and that when the Pipe begins to fill with Water, it then becomes opake and viſible. As for the reaſon of their diſſolving of themſelves after that they have drunk up a great quantity of Water, I take it to be by and through the great quantity of Water that they have carried up, which muſt needs thicken the Clouds, and impede their Motion, and by that means diſſolve the Pipes.

Strange Effects of a Spout in Lancaſhire, *by Dr.* Richardſon, *n.* 363. *p.* 1097.

VI. A remarkable Spout fell on *Emott-more*, nigh *Coln* in *Lancaſhire*, on *Tueſday* the 3d of *June*, 1718. about ten in the Morning: when ſeveral Perſons who were imploy'd in digging *Peat* nigh the place where this Accident happen'd, upon a ſudden were ſo terrify'd with an unuſual noiſe in the Air, that they left their Work and ran Home, which was about a Mile from the Place: But to their great ſurprize they were intercepted by Water; for a ſmall Brook in the Way was riſen about ſix Foot perpendicular in a few Minutes time, and had overflown the Bridge.

It is to be obſerv'd, that there was no Rain at that time on *Emott-more*, only a Miſt, which is very frequent upon thoſe high Mountains in Summer-time. There was a great Darkneſs in the Place where the Water fell, without either Thunder or Lightning, (as I had my Information from an Eye Witneſs). The Meadows at *Wicolae* were ſo much floated, that the like had not been ſeen in ſeveral Years before, though there it was a very bright Day.

Upon this account, I went to view the Place where the Water fell; though I believ'd this Inundation might proceed from an Eruption of Water out of the ſide of the Mountain; ſuch being not unfrequent, where Lead or Coal have been dug, but neither have ever been ſought for here. Upon approaching the Place, I was ſtruck with unſpeakable Horror, the Ground was torn up to the very Rock, where the Water fell, which was above ſeven Foot deep, and a deep Gulf made for above half a Mile, and vaſt heaps of Earth caſt up on each ſide of it, ſome pieces remaining yet above twenty Foot over, and ſix or ſeven Foot thick. About ten Acres of Ground were deſtroy'd by this Flood. The firſt Breach where the Water fell is about ſixty Foot over, and no appearance of any Eruption, the Ground being firm about it, and no Cavity appearing. I muſt not forget to mention, that the Ground on each ſide the Gulf was ſo ſhaken, that large *Chaſms* appear'd at above 30 Foot diſtance, which a few Days after I obſerv'd the Shepherds were filling up, leſt their Sheep ſhould fall into them.

Inundations in
Ireland, *com. by Mr.* Derham, *n.* 32. *p.* 309.

VII. Mr. *Neve*, a very intelligent Perſon from *Maghrafelt* in the North of *Ireland* tells me, That on *October* 7. 1706. after a very rainy Day, and Southerly Wind, there happened a prodigious *Flood* (the like not in the Memory of Man) which brake down ſeveral Bridges, and the Sides of ſome of the Mountains in that part of *Ireland*. That it came running down in vaſt Torrents from ſome of the Mountains, and drowned abundance of black Cattle and Sheep, ſpoiled a great deal of Corn and Hay in the Stacks, that it laid abundance of Houſes two or three Feet deep in the Water, and brake down ſeveral of the Forge and Mill-Dams.

July 3, 1707. they had another Flood, which came ſo ſuddenly from the Mountains, as if there had been ſome ſudden Eruption of the Waters. And alſo on the 26th of the ſame Month, in the County of *Antrim*, there was a very ſuddain and ſurprizing *Flood*, which raiſed the Six-Mile-River (ſo call'd) at that rate, that it brake down two ſtrong Stone-Bridges, and three Houſes, and carried away 600 Pieces of Linnen Cloath, that lay a Bleaching, fill'd many Houſes ſeveral Feet deep with Water, tore down ſome large Rocks in its Paſſage, and left ſeveral Meadows covered a Foot or two deep with Sand. That they in the South-Eaſt part of the County of *Derry*, had that Day but little Rain with ſome Thunder: But beyond the Mountains, in the North-weſt part of the County, the River *Roe* had a great Flood.

An Eruption of Waters in Craven, *by Mr.* Thoresby *n* 306. *n.* 2236.
† *Abr. Vol.* II. *p* 328.

VIII. In † *Phil. Tranſact.* N°. 245. An account is given of an extraordinary Eruption of Water in *Craven*. To which may be added, that on the opening of the Rock, at the Foot whereof the Town of *Starbotham* ſtands, the Water guſh'd out in ſo vaſt a Quantity as if it would have ſwept away the whole Town: The Waves came rolling down, like long Swarths of Graſs one upon another, to uſe the Metaphor of the Relater, who had never ſeen the Sea. Several Houſes were ruin'd, and others wreckt up to the Chamber Windows; one particularly ſo cover'd, that a great piece of the Rock was left upon the top of the Chimney.

Eruption of a Burning Spring, by Mr. Hopton, *n.* 334. *p.* 475

IX. A famous boyling Well at *Broſeley* near *Wenlock* in the County of *Salop*, was diſcovered about *June*, 1711. It was firſt found out by a terrible uncommon Noiſe in the Night (about two Nights after a remarkable Day of Thunder:) The Noiſe was ſo very great, that it awaked ſeveral People in their Beds, that liv'd hard by; who being willing to be ſatiſfy'd what it was, roſe up from their Beds; and coming to a boggy Place under a little Hill about 200 Yards off the River *Severn*, perceiv'd a mighty rumbling and ſhaking in the Earth, and a little boyling up of Water through the Graſs. They took a Spade, and digging up ſome part of the Earth, immediately the Water flew up a great Height, and a Candle that was in their Hand ſet it on Fire.

To prevent the Spring being deſtroy'd, there's an Iron Ciſtern plac'd about it, with a Cover upon it to be lock'd, and a Hole in the middle thereof, that any who come may ſee the Water through. If you put a lighted Candle or any thing of Fire to this Hole, the Water immediately takes Fire, and burns like Spirit of Wine or Brandy, and continues ſo as long as you keep the Air from it; but by taking up the Cover of the Ciſtern, it quickly goes out. The heat of this Fire much exceeds the heat of any Fire I ever ſaw, and ſeems to have more than ordinary fierceneſs with it. Some People out of Curioſity, after they have ſet the Water on Fire, have put a Kettle of Water over the Ciſtern, and in it Green Peas, or a Joint of Meat, and boyled it much ſooner than over any artificial Fire that can be made. If you put green Boughs, or any thing elſe that will burn upon it, it preſently conſumes them to Aſhes. The Water of itſelf is as cold as any Water I ever felt; and what is remarkable, as ſoon as ever the Fire is out, if you put your Hands into it, it feels as cold as if there had been no ſuch thing as Fire near it. It ſtill continues boyling up with a conſiderable Noiſe; and is viſited by almoſt all that hear of it.

A Mineral Water at Canterbury, *by Dr.* Des Moulins, *n. 312. p. 2462.*

X. About 12 Years ago a Mineral Water was accidentally diſcover'd in this City. In digging the Ground, they firſt met with a fat black Mold, extending its ſelf 3 Foot deep, and gradually changing into another ſort of Earth, very fat and like Butter. This ſecond Lay was two Foot thick, the Colour yellow, ſomething mixt; its Odour ſtrong and Mineral; and a piece of it being ſometime expos'd to the Sun, ſmelled much like burning Sulphur. After this they found a Quick Sand of a darker Colour than the firſt Earth, mixt with ſeveral little Stones, and the Smell ſtill ſtronger than before. Two Foot further, under the Quickſand, a hard Rock appear'd, out of which Water guſh'd with ſome Violence. They dug two Wells about 7 Feet diſtance from each other; one about eight or nine Feet deep from its Surface, and twelve from the Surface of the Ground about it, and reacheth the Rock: T'other is not ſo deep by two Foot, and only toucheth the Sand. This laſt is ſomething ſtronger of the Sulphur, but the other is ſtronger of the Mineral Spirit and ferruginous parts.

Two Drams of the ſecond Lay of Earth, found in digging, being put into four Ounces of Spirit of Vinegar, there preſently aroſe a conſiderable Ebullition; and ſoon after the Spirit was ting'd with a yellow browniſh Colour, which ſuffer'd no Alteration with the Infuſion of Logwood, nor with Galls, but with Oyl of *Tart. p. deliq.* turn'd greeniſh, and with the Infuſion of *Lig. nepb.* of a pale red. The Water taken up at the Spring is extraordinary limpid, but grows ſomething whitiſh in a quarter of an Hour, and in half an Hour the Spirit is loſt and the Mineral hangs firſt on the ſides of the Glaſs, and then falls gradually to the bottom. It won't keep quite ſo well as the *Spaw* or *Tunbridge* Water. Its Taſte is maſculine and auſtere; the Smell ferruginous and ſtrong, ſomething upon the Sulphur: People ſay it ſmells like Gunpowder. It will make the Root of the Tongue of the Drinkers look blackiſh. Linnen waſh'd in it turns yellow. It will not lather with Soap. The Glaſſes the Water is dipp'd with grow yellow, which no ſcowering can take off, and are apt to fly. In froſty and cold Weather, it is ſo warm as to melt Ice and Snow; in other Seaſons it is cold, though not ſo cold as ſome Spring Waters are.

The weight of this Water varies much according to the Seaſons and Weather. In *May* 1704, it weighed three Grains lighter than Common Water in the quantity of a Pound. In the Spring of 1705, it was equal in weight to common Water; and is now ſtill heavier in *Auguſt* following, becauſe of the exceeding dry Weather of that Summer. But in general about Midſummer, if the Weather is no ways extraordinary, it's pretty equal to common Water in weight. A ſingle Grain weight of good Gall will turn a Pint and a half of this Water of a very noble deep red, and in an inſtant. Syrup of Violets turns it of a Graſs green. With the Infuſion of Braſile it giveth a deep lively Blue: with that of *Lign. nephr.* firſt a light Green, then a light yellow, with a blue Crown: with the Infuſion of Logwood, a blue Black: with that of Fuſtick Wood, a dusky Yellow: with the Flowers of Pomgranates, a fair Violet: with Leaves of Thea, a fine purpliſh blue: with good Nants Brandy, an Elegant Sky-colour. It turns a Solution of the *Sacch. Saturn.* milky in an inſtant, and the Solution of Sublimate in ſome time longer. *Ol. tart. per deliq. ſp. Sal. Armon. ſp. Vitr. &c.* make no ſenſible Alteration.

In calm Weather, in Winter eſpecially, a thick oily Film covers the ſurface of theſe Waters, of as great a variety of Colours as a Rainbow; a Spoonful of it drunk, hath the effect of, and compoſeth as much to Sleep, as a moderate Doſe of Opium. Some of this Scum, being dryed by Evaporation, taſted very fat, and felt ſo between the Fingers. Some of this Powder being caſt upon a red hot Iron, moſt of it immediately burn'd away with ſome ſparkling; and what remain'd was of the Colour of ruſt of Iron, and taſted partly Stiptick and Earthy, and partly Saltiſh. The Water it ſelf, being gently evaporated, yields a yellowiſh Sediment, more or leſs, according to the Seaſons. Laſt Spring a Quart yielded ſix Grains of it; but in *September* following, the ſame Quantity afforded me nine Grains; whereas a Pound of *Tunbridge* Water gave but one ſingle Grain of Sediment to Mr. *Boyle*, as appears by his Memoirs of *Mineral Waters*. This Sediment being boil'd in common Water, made a ſtrong *Lixivium*, with which Acids caus'd no ſenſible Fermentation; but Syrup of Violets turned it Green. This *Lixivium* being evaporated, yielded a fat ſulphurous Salt, that would not coagulate into Cryſtals. I can get but three or four Grains of it out of ten Grains of Sediment; but from the Colour and Taſte of the *Lixivium*, I have reaſon to ſuſpect, that there is a larger proportion of Saline Particles, which as I conceive, being Volatile, evaporate away with the Water.

As for their Medicinal Virtues, I might ſay a great deal, but hoping to enlarge upon it another time, I ſhall only tell you, Sir, that from the many and truly wonderful Cures, I believe it to be one of the moſt excellent Waters of this kind, as yet found out in *England*. The little Well is very uſeful in Diſeaſes of the Breaſt, as in *Aſthma*'s, Coughs, Rheums and Catarrhs. It hath cured ſeveral given over of Conſumptions of the Lungs. Moſt Diſorders of the Stomach are cured by this Water. It ſeldom fails in the Cure of Rheumatick gouty Pains of the Limbs, or other Parts of the Body, in the Scurvy and Melancholy Diſtempers, Jaundice, Vapours, all ſorts of Stoppages, Scabs, Itch, *&c.* But in Gravel, Cholick, and Greenſickneſs, 'tis a true Specifick, as alſo in inward Ulcers, if not too far gone. A Potter of *Bolton*, who had ſpent his Subſtance in Doctors, and was laſt Spring diſcharged out of St. *Thomas*'s Hoſpital, as an Incurable Perſon, hath been cured of his Ulcer in the Bladder this Summer, with drinking of this Water for three Months together. In Agues it is beyond the Bark: I have ſeen ſome rebellious ones, that could not be removed by the Bark, perfectly cured by this Water, and ſome Conſtitutions quite worn out by the frequent Relapſes of this Diſtemper, reſtored again. This is alſo remarkable, that it agrees beſt with old, decayed, and weak Conſtitutions. The Water ſits pleaſantly upon the Stomach, works off by Urine very briskly, cauſeth a good Appetite, chears the Spirits, and procures Sleep. It is not binding, as ſome other Chalybeats are, but keeps the Body open to moſt People, and upon ſome it brings now and then a gentle Looſeneſs, which carries off the Diſtemper. For theſe four Years I have preſcrib'd 'em to many Scores of People every Seaſon, and I could never obſerve any inconveniency, or ill Symptom ariſe from the drinking of 'em.

An Examen of the Spaw-Waters, by Dr. Slare, *n.* 337. *p.* 247.

XI. Dr. *Jordis*, a Fellow of the *Royal Society*, with whom I kept a Correſpondence for above thirty Years paſt, practiſed Phyſick at *Francford*, and often at *Swalbac* in Summer-time: I deſired him to examine the Spaw Waters, and give me an account of the Contents of that *Sowr-Brunn* or *Acidula* (ſo much celebrated for its Virtues, and Concourſe of Perſons of the greateſt Quality.) He gave me an account of ſome *Ocres*, or Ferrugineous Parts, which he calcin'd and tortur'd in the Fire, to make them confeſs their Sulphur Original; but in all his Experiments did not ſatisfy me that the Water held one Drop of an Acid by Diſtillation, *&c.* That which gave me the firſt Suſpicion, that the *Chalybeat* Waters did not contain any rough, or Vitriolic, or Acid Salts in them, proceeded from an accidental Uſe of a ſtrong Iron Water, in which I diſſolved Soap, and found it lather and waſh my Hands well, and then I us'd a Waſh-ball and ſhav'd with it; and try'd ſeveral other Waters of this ſort, which did the ſame, and much better than ſome Pump-Waters.

I conſulted my Palate, and try'd whether I could diſcover any Sharpneſs or Acidity in our *Engliſh* Steel-Waters at *Tunbridge*, at *Black-Boy* in the Pariſh of *Franfield* in *Suſſex*, *Hampſted*, *Sunning-hill* in *Berkſhire*, &c. but I was ſo far from diſcovering any ſuch Thing, that theſe Waters ſeem'd rather to leave a ſweetiſh Flavour or Fare-well behind: Thus many Alkaly Salts, if nicely examined (of the fix'd kind) have affected my Taſte.

I made Experiments with ſeveral ſorts of ſuch Spirits as are apt to ferment with Acids; ſuch as Spirit of *Hart's-horn*, of *Sal Armoniac*, &c. but theſe made no Ferment, nor any Motion or Change in theſe Waters.

I conſider'd the Diſeaſes in human Bodies, which theſe Waters were preſcrib'd, by Phyſicians, to cure; that they were often ſuch as proceeded from ſharp, acid, or acrimonious Cauſes, as *Cardialgiæ* or Heart-burnings, ſower Vomitings, Corroſive *Diarrhæa*'s, Colicks from Scurvies and Stranguries; and that for theſe Diſtempers ſweetning and Alkaliſate Remedies are made uſe of.

I conſider theſe Waters as containing in them the Properties of Iron; and I find by Experience, that it is moſt oppoſite to Acids, being one of their great Correctors, and therefore rather to be eſteemed an Alkali.

1. Take ſome filings of Iron, perhaps a Dram, and pour on them about an Ounce of the milder Acids, ſuch as Vinegar, Verjuice, or the Juice of Lemons, and it will deſtroy the Sharpneſs of theſe Juices: Or if you pour on theſe filings Mineral Acids, as the very corroſive Spirit of Nitre, or of Salt, or what is call'd Oil of Vitriol, they will immediately loſe their Acidity, be diſarm'd of their ſharp Points, and by Evaporation give a Salt that will taſte ſweetiſh, and is by Chymiſts call'd *Saccharum Martis*, if duly prepared; which is ſafely given inwardly, and is eſteem'd a good altering Medicine. 2. Steel beaten to a fine Powder is, without any farther Preparation, given inwardly with great Succeſs for Stomachic Diſeaſes, as in the Green-Sickneſs, Hypochondriac and various other Acid and Acrimonious Diſaffections.

I conſider'd Milk to be a very proper and obvious Subject to bring this Controverſy to a plain and unqueſtionable Deciſion. I made this Experiment with all poſſible Exactneſs: I firſt prov'd the Chalybeat Waters, more particularly the Spaw-Waters, by trying whether they tinged with Galls. Theſe being very good, I put part of the Waters to cold Milk; ſome I only made lukewarm, and ſome I boil'd together, in equal Proportions: But they were ſo far from affording any Curd or Coagulation, that they continued ſeveral Days without being ſowr.

Since Mineral Waters, eſpecially thoſe that are Chalybeat, are of ſuch important uſe in Phyſick, and have gained amongſt us ſo juſt a Reputation for their excellent Virtues, and are the greateſt refuge in very potent and obſtinate Diſeaſes; this has made me judge it a work not unacceptable to Virtuoſo's, eſpecially thoſe of the faculty of Phyſick, to have this Medicine fairly examined, its genuine Properties aſſerted, and what was called an Acid to be demonſtrated an *Alkali*. Is it not a ſort of Juſtice due to the World, that the *Germans*, who ſent us over theſe Waters, with this falſe Character of Sowre Waters, ſhould baniſh this miſguiding Term from their *Spaw's*? It is from this Miſtake, that their Phyſicians do prohibit the uſe of all manner of *Lacticinia*, as if they were as noxious as deadly Poiſons, whilſt they are in a courſe of their Medicinal Waters.

Since this prejudice has prevail'd very much amongſt moſt of our Water Drinkers in *England*, I do atteſt that I have frequently adviſ'd, in ſome Caſes, Milk to be given daily in the Evening, through a whole Courſe of Steel-Waters, with good Effect: Nay, I do affirm, That ſome others could not bear the Waters without having a third part of Milk or more mix'd with them, and have continued them ſo for many Weeks with good advantage: Nor do I find the leaſt reaſon to prohibit the uſe of Milk in a Courſe of *Bath* Waters, having been here above a Year and half, making the beſt Scrutiny I can into the Properties, Virtues, and Vices (if they have any) of theſe Waters: But of theſe Waters I may probably give ſome Account hereafter.

Since our Experiments diſcover, that thoſe Things which are of a ſweetning *Alkaliſate* Nature, do ſo very well agree with theſe Mineral Waters, it will appear by the following Experiments that *Acids* do very much diſagree. I put but one drop of Oil of Vitriol to a large Glaſs full of ſtrong *Spaw-Waters*, which before the Addition of this *Acid* did give a deep purple to the Solution of Galls; but now would not give the leaſt Tincture, though I put in four times as much of the Galls. From hence I conclude, that the Virtues of the *Chalybeat* Ingredients, which I take to be the Life and Soul of theſe Waters, were ſo far bound up or deſtroy'd as to have loſt their Cordial or corroborating Faculty; and that the Bile or Gall in the humane Bowels could not be able to ſeparate the *Chalybeat* (which are the only Medical) Particles, and mix them with the Chyle, in order to any End in Phyſick. Let this be a Caution to thoſe that deſign to make theſe Waters paſs better by Urine, that they do not make uſe of any *Acids*; it being a common Practice to uſe Spirit of Vitriol, *Spiritus Nitri dulcis*, &c. as a Diuretick: Unleſs it ſhould ſo happen, that they have a deſign to take off, and diveſt them of their warm cordial or altering Power, and ſo to bring them near to common Water; which I muſt confeſs we are forced to do, eſpecially in the uſe of *Bath* Waters, in ſome hot Inflammatory Caſes.

I ſhall conclude with one ſhort Experiment in favour of our *Alkalis*; that if you put any *Alkali* Salt, volatile or fix'd, ſuch as Volatile Salt of Hartſhorn, or of *Sal Armoniac*, or fix'd Salt of *Tartar*, of Wormwood, or any other true *Alkali*, you will then deſtroy the above-nam'd Acid Spirit, recover the virtue of the Waters, and diſpoſe them to give their Tincture as they uſed to do in their natural State.

XII. Having procur'd about a dozen Quarts of *Pyrmont* Waters this laſt Summer, I made ſome Tryals with them. I found by the Taſte, that

Of the Pyrmont Waters, by the ſame, n. 351 *p.* 564.

that they contain'd a rich Chalybeat Vertue, and alſo made a very brisk and lively Impreſſion on the Palate, more grateful and ſpirituous, than the beſt *Spaw* Waters I ever taſted. The *Spaw* Waters are look'd upon as moſt excellent, if they ſparkle a little in the Glaſs: but theſe in Summer-time, when pour'd into the Glaſs, nay ſometimes even in the Bottle, as ſoon as the Cork was open'd and the Air was admitted, would make a notable Ebullition, ſomewhat like bottled Cyder, though this was ſoon over; but they did yet continue their ſmart and brisk Taſte, and high Chalybeat Reliſh to the laſt Drop, though we were ſome Hours in drinking them off. In the Wintertime, theſe Waters do not Sparkle, nor Ferment, at leaſt mine did not; but they were not carefully preſerv'd, being expos'd in cold Cellers, where our Beer or Wine ſtood in the Winter; and yet notwithſtanding, they loſt not the Chalybeat Taſte, and alſo retain'd a very pleaſant brisk Guſt. Theſe Waters have been reckon'd in the Number of the *German* **Saur Brunnen** or *Acidulæ*, and ſome of my Friends, to whom I gave a Glaſs of the Water, have aſcrib'd to it a ſharp Taſte, and have been ready to run away with a poſſeſs'd Opinion of its being Sour: but when I requir'd them to call back that haſty Aſſertion, and to conſider it better, whether that Taſte was really Sour or Acid, they have been forc'd to recant and confeſs, that the ſmart and brisk Taſte miſled them to call it Acid or truly Sour. Thus Cyder and ſoft Ale when Bottled, will give ſuch an acute Affection to the Palate, when it is far from being Sour: And even *Volatile Alkalies* of *Sal Armoniac* or of Hartshorn, may be made to give the like pungency to the Tongue.

In order to a more nice Enquiry, whether any Acidity were diſcoverable in theſe *Pyrmont* Waters, we dropt in conſiderable Quantities both of Spirit of Hartshorn, and of Spirit of *Sal Armoniac*, both juſtly prepar'd; but could not diſcover the leaſt Luctation or Motion to appear upon this Conjunction, as it uſually does with an Acid. I made a yet more nice and certain Examen of theſe Waters, by mixing Milk with them, ſometimes in equal, ſometimes in double Proportion; and in various degrees of Warmth, both in Lukewarm degrees, and alſo with a boyling Heat, but I could not perceive any Curdling. But rather on the contrary, the Water preſerv'd the Milk from Coagulation, for four or five Days, even in *September*, it being hot Weather.

Take a very little Gall in Powder, about half a Grain to a Glaſs of a quarter of a Pint; this does in a Moment render it turbid, and make a dark Purple, eſpecially if you ſtir it: but if you drop the Powder on the Surface of the ſame Water, it then cauſes a fine blew Tincture. If you will make a very fine Tincture pleaſant to the Spectator, Take five Leaves of ſtrong Green Tea, put them into the bottom of a Glaſs holding a quarter of a Pint, and you will ſee thoſe Leaves unfold themſelves, and in a quarter of an Hour, tinge the Water with ſuch a cerulous azure Blue, that few Vegetables do afford the like. We obſerve, that the longer theſe Leaves, or any other Stipticks, (which are the Precipitators) do ſtay together, the more they degenerate into a deep Purple, or even to an Atramentarious Colour.

In reference to the internal Uſe of theſe Waters, I drank about a Quart at a time, after this manner. I firſt began with the *Spaw* Waters, which I procur'd very good, and drank them for a Week, and they agreed very well. I then drank the *Pyrmont* Waters for three or four Days, and continued the uſe of theſe Waters alternately, until I had drank about twenty Days. By the reſult of my Experiment it ſeem'd to me very plain, that the *Pyrmont* Water was more agreeable, gave more Strength and Spirit, and was as much or more preferable for its internal Vertue, as for its excelling the other in a brisker and more ſprightly Taſte.

There is another Excellency in theſe Waters which will make them more uſeful to us, than any Foreign *Chalybeat* Waters we yet know; becauſe theſe will keep better, they are not ſo ſoon ſpoil'd by any accidental Inſinuations of Air, as the *Spaw* are ſubject to be. The *Chalybeat* Mineral is here throughly diſſolv'd and well united, and mix'd in this Water, ſo that it does not eaſily precipitate: for which Reaſon it may alſo the better paſs the *vaſa-lactea*, and even enter into the Maſs of Blood it ſelf, and work the more conſiderable Effects. That this is not a bare Hypotheſis may be prov'd by this Experiment.

Having ſuffer'd the *Spaw* Water to be expoſed in a Bottle which was half full, and unſtopt 12 Hours, I examin'd it, and found it taſte juſt like common Water; but the *Pyrmont* Waters that were opened to the Air after the ſame Manner, taſted ſtrong of the Mineral, and gave their Tincture as at firſt; nay, they continued thus for full two Days, and perhaps might have done ſo longer, but I thought that Time ſuffic'd. I may fairly conclude, That ſince the *Spaw* has been very beneficial to our Patients in Chronical Diſeaſes, theſe Waters of a much ſuperior Virtue will ſurpaſs them in conquering many of our obſtinate Diſtempers.

Having had lately ſome Diſcourſe about a purging Quality contain'd in theſe Waters, I am now inquiring into the Truth of this Queſtion, whether they in reality do contain any Purging Ingredients or Properties.

I evaporated about a Quart of this Water *ad ſiccitatem*; I then poured on the *reliquiæ* ſome Rain-Water, enough to diſſolve and take up the Salts, and exhal'd that Water, and had a Grain or two of the Salts, that taſted *muriatic*, ſuch as moſt River and Pump Waters give. It is well known that the Purging Waters have a very bitter Taſte, and by the learned Doctor *Grew* that Salt was called *Sal Catharticum amarum*, which diſtinguiſh'd it from all other Species of natural Salts: that of the *Pyrmont* Water above-mention'd has no Relation to this, but to the Sea-Salt, not being in the leaſt bitter.

It is alſo well known, that unleſs our Waters be impregnated with a conſiderable Quantity of this bitter Salt, it will not purge at all: Two or three Grains ſignifie nothing, nor have the leaſt Cathartic Power. For Example, Put two Drams of the purging Salts to a Quart of common Water; and this Quantity will give but a Stool or two to one who is naturally very eaſy to work upon. I have examined ſeveral other *Chalybeat* Waters, and found much the like Ingredients, and never any that I could ſuſpect to carry any purging Properties.

I think we can much better demonſtrate that the *Chalybeat* Waters do contain Stiptic and Reſtringent Virtues, becauſe they owe their Birth to the *Iron Mineral*, and more particularly to the *Pyrites*, which Doctor *Liſter* ſuggeſts, (not without ſome Reaſon) to be the Parent even of all *Iron Oars*, as it is doubtleſs the Cauſe of all *Chalybeat* Waters: Thus I have often examined the Solution of the *Pyrites* by the Rain Water at *Debtford*, and at other Places where Copperas is made, and found it a very ſtrong *Chalybeat* Water. It is from this *Mineral* we have our ſtrong Stiptic and conſtringent Medicines, for external and internal uſe; we have our Powders and Salts of *Steel*, or *Vitriol* of *Mars*, from hence; nay, even thoſe obſtinate and inveterate *Diarrhœas* which have baffled the Force of all Medicines, have, by a judicious Uſe of *Tunbridge* and other Iron Waters, received a Cure.

But notwithſtanding all we can ſay, it will be retorted, that there is Matter of Fact and Experience againſt us, that the Waters really do purge at *Pyrmont*, where they are drank. This we do allow to be true, that *Tunbridge* Waters do not only purge but ſometimes vomit, when drank haſtily and in great Quantity; but our Phyſicians have corrected this Irregularity, and we hear of no ſuch Complaints, where they obſerve a juſt *Regimen*. And we do all agree, that thoſe Waters are in their own Nature binding, and do oft require ſome opening Medicine. The Quantities of Water drank at *Pyrmont* are very large, often two or three *Engliſh* Quarts. It is no Wonder that their Weight forces them thorow the Bowels; for any common Water drank haſtily, and in ſuch Quantity, will do the ſame. Whereas, if you take this Method, and will drink *Pyrmont*, or any other *Chalybeat* Waters leiſurely, *viz.* a Pint Glaſs in an Hour, or rather two half Pint Glaſſes, you may drink three Pints in ſo many Hours without Danger of loſing them by Dejection. But if any one will be careful, and take this Caution with him, he will ſcarce fail of Succeſs: that is, let him be very quiet and ſtill, both in Body and Mind; the leſs he ſtirs or walks, the better he will paſs off his Waters by Urine. And though this will appear a Paradox, eſpecially to thoſe Phyſicians who practiſe abroad, and commend to their Patients much Action in walking, yet I know I have both Reaſon and Experience on my Side. To avoid Prolixity, I ſhall not declare them at this Time, and ſhall only aſk leave to mention one Obſervation I have made, that none of our *Engliſh* Steel Waters do ſtrike ſuch a Purple as the Foreign celebrated *Chalybeat* Waters do: for ours do give a more turbid and dark Colour, and the worſe the Waters are, the blacker Sediment they make: Thoſe of *Iſlington* abound with a coarſe *Oker*, the Mineral is not well diſſolv'd, but gives an *atramentarious* Colour; but the *Pyrmont* Waters excell all I have happened to examine, in its bright *Cærulious* Luſtre.

A Note by —
ib. p. 569.

N. B. *Moſt of the Experiments alledg'd by Dr.* Slare, *in the foregoing Diſcourſe, were likewiſe by him ſhewn before the* Royal Society, Feb. 28. 1717. *and it was found that the* Pyrmont *Waters gave a much more exalted* Chalybeat *Taſte than the* Spaw; *and a ſmall Quantity of each being kept for ſome time in Bottles, to compare them, the* Pyrmont *was found to have retained its Virtues much better than the* Spaw. *The Preſident, and ſeveral of the Members preſent, having drunk a Glaſs of it, found it of a very agreeable Reliſh, and to ſit eaſy on the Stomach.*

Of the Lake Vetter *in* Sweden, *by Dr* Urban Hearn, *n.* 298. *p.* 1938.

X. Vetterus a Septentione Meridiem uſque vergens, de Askerſundio Nericiæ ad Jonekopiam Smolandiæ 14. Suecica metitur milliaria, quorum quodlibet 5 vel 6 milliaria Anglica, & decem unum fere conficiunt gradum. Latitudine vero 3, nonnunquam vix 2. ſuperans Milliaria, Gothiam in duas dividit partes, quarum quæ ad orientem ſita, *Oſtrogothia*, & ad *Occidentem Weſtrogothia* communiter nuncupatur. Illius ad ripam cum arce & Civitate Wadſtenenſi celebris cernitur mons *Ahme* vel *Ohme*, ad hujus vero vetus illud Weſtrogothiæ oppidum *Hio*. Lacus autem ipſe, ob elevatiores montium colles, qui hunc in ipſo litore ſæpius ambiunt, nonnunquam paulo remotiores prominent, adſtantibus ſemper apparet ad latera depreſſus. Profunditate gaudet inſigni, adeo vero inæquali, ut aliquibus in locis ad 80, in confiniis vero *Oſtrogothiæ* diverſis, paucisq; *Weſtrogothiæ*, ad trecentas uſq; orgyas nullum reperitur fundum. Confirmat hoc ſingulare quoddam experimentum, cujus me participem non ita pridem fecit Magiſter *Ericus Simonius* Paſtor & Præpoſitus *Vadſtenenſis*, extitiſſe videlicet civem quendam *Vadſtenenſem* Benedictum *Amberni*, qui ut ad litora civitatis *Grennenſis Vetteri* exploraret profunditatem, aliquot centum Orgyarum funes, ſecuri loco ponderis appenſa, demiſerat, fundo autem nuſquam reperto, cum funes iterum collegerat, ſecuri deperdita, cranium equi chordæ exacte alligatum obtinuit. Similis item abyſſus ad præcipitia montis *Ohmenſis*, quæ *parietis occidentalis* nomine inſigniuntur, rimantium ſcrutinia ſemper illuſit, ut eapropter non facile quiſquam his adpropinquare audeat metu Zephyri, qui ſubito increſcens, anchoris nequidquam juvantibus quamvis undiq; jactis, ad declivia montium navigia facile protrudit. Pariter ad *Weſtrogothiæ* quandam plagam altitudinem aquarum metiri cupiens olim Gubernator Comes *Johannes Oxenſtierna*, projectis 300 orgyarum funibus nullum offendit fundum, prout hoc teſtantur piſcatores adhuc in vivis, quibus hoc negotii illo tempore committebatur. Limpida non minus quam profunda aquarum hæc eſt congeries, ut ad diſtantiam inſignem parvulus in fundo cernatur nummus. Ipſe Magiſter *Ericus Simonius* album vel denarium 60 immerſum cubitis aere ſereniore ſe fatetur obſervaſſe.

vaſſe. A ſuperficie autem remotior aqua aliqua quaſi viriditate tincta videtur: Et mirum ſane tot ſeſe in hanc exonerantes paludum, montium, ſylvarumq; ſordes, limpidam hanc aquam ne leviter quidem inficere.

Amplitudine licet multos noſter ſuperet lacus, ut plurimum tamen a ſcopulis immunis pauciſſimis gaudet inſulis. Quarum præcipua Comitum *Brachæorum* antehac ſedes *Viſingſoe* dicta, in medio aquarum *Grennam Smolandiæ* & *Weſtrogothiam* interjacet, prout ad boream inſula *Roknenſis* Acidulis *Medevienſibus* e regione eſt oppoſita. Apparent & aliæ ad litora ſitæ inſulæ, pauciſſimæ tamen æquæ ac parvæ. Cum vero ventis ſic libere expoſitus, proceris undique cingatur *Vetterus* montibus, nil mirum raro eundem quieſcere, ſed procellis ſæpius agitatum, altioribus arctiſque fluctibus navigantium cymbas vehementer concutere; Idq; adeo ſæpe inopinato, ut aquis inſtar ſpeculi quietis tecte commoveri incipiat, antequam vel minima aeris ventilatio ſentiatur. Quod efficere videtur tempeſtas, ſub aquis aliunde oriunda, ſenſim eundem protrudens, priuſquam ventorum turbines eouſq; potuere derivari. Haud enim in *Vettero* infrequens furentibus ventis ferri navigia in uno loco, cum alia in confiniis ob tranquillitatem aeris remis propelli cernuntur. Indicio minime fruſtraneo a ventis ſubterraneis irruptiones ejuſmodi aquarum abunde promoveri eodem plane modo, atq; ſimiles effectus explicare conatur *Varenius* in *Geograph. Univer.* Confirmant has ſuſpiciones Phænomena diverſa. Imminente enim Tempeſtate imbribuſq; ululatus vel tonitru aquarum aere adhuc ſereno percipiuntur, quod mihi ipſi ad *Medevienſes* Acidulas, aura etiamnum placidiſſima, non raro audire contigit, ſubſequente ſemper turbine procelloſo. Manifeſtius adhuc hoc experiuntur incolæ *Viſingſoenſes*, quibus ab illo tractu inſulæ, unde die poſteriori venti oriuntur, inſtar ictuum tormentorum aures confuſe vellicantur. Cumq; ad orientem ejuſmodi rugitus deprehenduntur, utplurimum cum grandine & pluviis excitari ſolet Eurus. Conſideratione etiam dignæ variæ illæ ſunt ſufflationes, vadorum ſubitaneæ elevationes, & confeſtim proſilientes halitus, quos in hoc lacu nonnulli obſervavere. Non abſque admiratione tale quid cum ſociis animadvertit Architectus *Abraham Winandz*, qui has oras aliquando præteriens, aquis tum maxime quieſcentibus, ſtrictim hinc inde inſtar telorum e fundo ejaculari nubeculas conſpexit, qui deinceps fumi in aere ſeſe jungentes, levibus pluviis toto die peregrinantes infeſtarunt, quæ omnia ventorum ſubterraneorum præſentiam non incerte arguunt.

Idem proculdubio ventus, cum ſuperius adveniente procella, in cauſa eſt, quod cum tempore verno glacies adhuc valida & ſpiſſa hac hora equis trahiſq; ſuſtinendis abunde ſufficiat; altera, glacie evaneſcente ejuſdem ruptum per totum lacum repente adeo contingat, ut qui paulo ante equis ſecure vehebatur, jam aqua undiq; patente ibidem placide queat navigare. Antequam vero ejuſmodi metuenda irruptio, ſtupendus qui præcedit aquarum rugitus viatoribus fugam cum terrore ſuadet, qui tamen a litore aliquando remotiores, vel aquis extemplo immerguntur, vel ſuper glaciei fragmenta morti vicini aliquandiu vagari coguntur. Nonnunquam abrupte fundum petit glacies aere vel minime commoto.

Num vero ſubterraneis ejuſmodi ventis excitandis metallici inſerviant halitus, hac vice in medio relinquo. Eos vero illic loci neutiquam deficere evincunt varii ad *Vetteri* boreales *Nericiæ Weſtrogothiæq;* plagas ſiti montes, venis martialibus, fortaſſe & metallicis nobilioribus nuperius detectis, aliiſq; mineralium ſpeciebus diverſis, Antimonio videlicet, Magneſia, Calce, Mica ſterili nitido, Galenæ ſpeciebus, Ochra Pyriteque opulenter referti, unde Sulphur, Vitriolum, Alumen aliiq; ſucci minerales elici alioqui conſuevere. Quin in ipſis pariter aquis, non minor Pyritis quantitas quam Ochræ cujuſdam ferruginoſæ copioſa reperitur congeries, cujus fruſtula curioſitatis ergo non raro ipſemet collegi. Huc ignis referendus eſt fatuus, non ad litora ſolum frequenter obſervatus, ſed tempore nocturno in mediis aquis volitare & piſcatores confundere viſus. Quem creſcentibus metallicis ſulphureiſq; deberi halitibus plurimis eſt perſuaſum. Nec ſine Vaporum mineralium ope Granati, Porphyrii, Jaſpides, Chyſtalli, ſelectique alii generantur in hoc lacu lapides, qui a beato Comite *Petro Braheo* olim collecti, & ad tantum redacti fuere nitorem, ut inter ornamenta Sponſarum etiamnum *Viſingsburgi* adhibeantur. Quæ omnia metallicam agnoſcunt proſapiam, ut *Vettero* propinquas *Medevienſes* taceam Acidulas, quarum deſcriptionem proxime animus eſt exhibere.

Inter reliquas noſtri lacus proprietates admirationem ſane non effugiunt inſignes ſub aquis vortices, torrenteſq; pertinaces, qui in hoc unico licet gaudentes oſtio ventis fluctibuſq; directe obverſi piſcatoribus non leve faceſſunt negotium. Suſpicio hinc enata ob profunditatem inexhauſtam, clam ruentes alveos ventoſq; ſub terra genitos aliquam huic *Vettero* cum alio ab hoc ad occidentem X milliaribus *Suecicis* diſtante *Vennero* ſub tellure eſſe communicationem. Nec aliter ſuadent diverſæ voragines hos lacus interjacentes, quarum duas paræciæ *Fœgrenſis* voraginum albæ & nigræ nomine inſignitas, metiri curavit Dominus *Haddorphius* celebris in *Suecia* Antiquarius, altitudines vero deprehendit immenſas, motumq; in his obſervavit inteſtinum, ac ſi fermento turgidæ extitiſſent. Eidem opinioni fovet, quod abſq; cauſa manifeſta certis annis augeatur noſtra aqua, cum ſequentibus notabiliter iterum decreſcat. Animadvertit Paſtor *Motalenſis* Dominus *Daniel Kydelius* præteritis hiſce ſeptem Annis, certis quibuſdam in locis ſenſim adeo evanuiſſe *Vetterum*, ut ad aliquot orgyas ſicco pede illuc ambulare potuerit, quo cymbis antea vehi cogebatur, pluvia interea temporis, annis videlicet 1680, 1682, 1684 & 1685, undiq; abundantes. Anno vero 1686 verſus autumnum aqua paulatim iterum cernebatur augeri ad hunc uſq; annum 1688. An vero ſtata ſic ſervet tempora noſter lacus, ac *Vennerum* ſingulis ſeptem annis accreſcere ſeptemq; viciſſim diminui ejus rimatores contendunt, de hoc certi quid determinare nequeo. Admiratione itidem eſt dignum, aere ſereno tormentorum ibidem ſentiri exploſiones, *Holmiæ* aliiſq; in locis ad 30 milliaria diſtantibus inſtitutas. Ut cum Anno 1685. Regii Principes *Holmiæ* ſepelirentur hora quinta quilibet ictus exacte perciperetur. Pari facilitate tela Anno 1676 in pugna navali exploſa ad 30 circiter milliaria diſtincte fuere obſervata. Conſtat reperiri adhuc cavernam & quidem fœtore refertam ſulphureo & nauſeabundo, quem, aſſentientibus accolis, ipſi ſpeluncæ prope aquas in palude ſitæ & collecto per longius tempus ſqualori, ſulphureos, uvidoſq; exhalanti Vapores, potius adſcribendum cenſeo, quam cauſis quibuſvis vulgo allegari ſolitis. Adparere etiam in confiniis diverſa ſpectra & phantaſmata, quæ ut plurimum fœminarum, aliquando equorum vel alius animalis ludicra ſpecie ſeſe ſiſtunt, nemo hiſce curioſitatibus intentus inficiabitur.

Nec ſilentio præteriri debet celebris iſte amnis *Motala*, qui, unicum uti dictum *Vetteri* noſtri oſtium, certis temporibus fluiditatem quaſi deponere, & in decurſu adeo ſolet ſiſti, ut libere hunc ingredi, piſceſq; in fundo relictos abſq; impedimento capere nonnunquam fuerit conceſſum. Prout Anno 1682 & 1685 tempore *Natalitiorum Chriſti* idem eveniſſe conſtat. Utut varie hanc rem explicare conentur huic amni vicini, illo inſtanti aquas a litoribus recedentes fundum petere rati; ſemper tamen ſuſpicio mihi oborta fuit, vel glacie vel nive fluminis infima obſtructa munimentum aquis præbuiſſe inferioribus interea ſeſe in Mare exonerantibus. Anſam huic opinioni dedit, 1. Quod nunquam vere, æſtate vel autumno, ſed ſemper tempore *Natalitiorum Chriſti* vel novi Anni iſthæc contigerit mutatio. 2. Quod prope pontem ſemper contigerit, ubi aquis ultra tres ulnas minime profundis, aggerum lapidumque acervi quibus Pons innititur, fluminis decurſum refrænant. Hanc ſuſpicionem veritati conſonam teſtatur propria & aliorum experientia ſuffultus Paſtor Eccleſiæ *Motalenſis* in limine pontis habitans, qui herbas longiores, ut Potamogetan, Polygonum aquaticum, *&c.* a ponte ad propinquos anfractus in aquis germinare aſſeruit, & his glaciem ſtriarum inſtar & nivis congelatæ adhærere, quæ a flumine detruſa & in pontis fundamenta delata tractu temporis cumulari & toto amni ſiſtendo ſufficere poteſt. Fatentur pariter molitores ibidem habitantes, imminente fluxus cohibitione, niveas qnaſi moles e lacu derivari, quæ corpori, cui impingunt, inſtar glutinis adhærentes, fundum ſenſim petunt. Nec infrequens aquas per totum lacum uno die æqualiter quietas, altero irritatas prope pontem ſiſti. Quidquid vero ſit mirationem adhuc ſubit, non hyeme intenſiſſimo, ſed aere clementiore, & quidem ut plurimum circa ferias Natalitias, & novi anni retardationem contingere. Frigus forte ſub aquis adhuc viget, licet in aere ceſſaverit, vel glacies debilius congelata herbis aliiſq; impedimentis detenta, obſtructiones haſce parit.

De fonte quodam non longe a *Vetteri* litore in parœcia *Nyenſi* (ubi & Acidulæ *Medevienſes*) prope Templum & Paſtoris ædes ſito, quæ ex ingenua parochi digniſſimi D. *Jonæ Frodelii* aliorumq; relationibus haurire licuit pauca dicam. Eſurinum hunc fontem vel annonæ appellitant vatem, eo quod nunquam aqua ſufficienter repleatur, niſi annonæ ſuccedat ſequente Anno caritas. Ambiunt hunc fontem undiq; colles arenoſi molliores. Interjacet hos vallis depreſſa, ſed minime paludoſa. Ex hac occultis meatibus hæc Scaturigo promanat, in eo ſingulare quid obtinet, quod Æſtate pluviis abundante ut plurimum evadat aridus, cum viciſſim æſtatibus ſicciſſimis, inſtante fame, ut & ſecundum alios (quos attingere non vacat) bello, Regiam *Motalenſem Vadſtenenſemq;* viam inundet, prout multorum ibi habitantium evincunt teſtimonia. Anno 1685 pluviis & imbribus frequentiſſimo, penitus hic fons exaruit, nec ultra dimidium pedem ſqualida. Anni 1686 æſtate aqua accreſcere viſa eſt. Nec veritatem hujus narrationis in dubium revocare præſentis anni permittit ſicciſſima æſtas, qua cum aquis penitus vacui evaſerunt fontes vicini omnes, hic aqua quam maxime abundavit. Sequentia hac in parte attendentes momenta, faciliore negotio forte re enucleabimus.

1. Soli *Oſtrogothiæ* ex locis fonti proximioribus annonæ denunciari caritatem.
2. In tota hac Regione fontiſq; præcipue vicinia arenoſum eſſe campum, parte etiam aliqua limo duriore gaudente, quibus imprægnandis ſufficiens ſemper requiritur lympha; proinde etiam
3. Deficere ibidem ſegetes non niſi in ſiccioribus annis, cum contrarium obtineat *Iemptia*, aliæq; provinciæ nonnullæ ſeptentrionales.
4. Meteorum tempeſtatiſq; proventum, terræ & quidem ſub ſuperficie latentis aliquando ſequi indolem.
5. Prope colles arenoſos venis non patentibus per ſabulum quaſi colatura trajectas colligi aquas hujus ſcaturiginis.
6. Phyſicas ob cauſas imminente tempeſtate ſicciore, augeri vel abſcedere poſſe eas aquas, pluvioſa iterum decidere, quæ prolixius deducere alterius erit temporis & inſtituti.

Of Lough-neagh *Lake*, *by* Fra. Nevil, *Eſq*; *n.* 337. *p.* 260. *v. infr. Part* IV *p.* 145.

XI. I can affirm there is no petrifying Quality in that Water. I liv'd 14 Years in *Dungannon*, within five Miles of it, and was very often there, about the Skirts, for many Miles, and in a Boat upon it ſeveral times. I have taken the Survey of a great part of the Shore thereof, at ſuch a time as the Waters were very low, and a large Strand left in ſeveral Places: And many Trees lay in the Verge of the *Lough*, which I believe might ſome of them have lain there ſome hundreds of Years, which had been overturn'd by the *Lough*'s encroaching on the Land, where great Woods had grown; and many Roots of great Trees were ſtanding in their proper Places, where the Water had prevail'd on the Land, and no Alteration in the Wood at all, but it was firm, ſound Wood, without any Petrifaction. And Mr. *Brownlow*, whoſe Eſtate in *Ardmagh* lies contiguous to the *Lough*, told me, That he did believe that there was not any petrifying Quality in the Water; for that he had made ſeveral Tryals, and had order'd Holly Stakes to be driven into the Ground within the Verge of the *Lough*, and that ſome of them continued there many Years, but that he found no Alteration.

Yet notwithſtanding all this, there has been great quantities of ſuch ſort of Stone, like unto Wood, found upon the Strand after great Floods and Storms of Wind, which have put the *Lough* into a Ferment; the Waves breaking down the Banks, incroaching on the Land, and tumbling over Trees, by which Incroachment this ſort of Stones are diſcover'd: And

if ever they were Wood, they were petrify'd by the Earth, and not by the Water; of which kind I have ſeen ſeveral Pieces big and little, ſome like Oak, ſome Aſh, and ſome like Holly, with Bark, Grain and Knots like Wood; ſo that any by the Eye would judge it Wood, till they come to try it. I had a Piece about ſixteen Inches long, that look'd as if it had been a great Chip cut out of the ſide of an Oak-block, with the Bark on it; and in cutting ſuch Chips, there happens generally ſome Shakes or Flaws in ſuch large Chips, ſo that there will be a Separation of Parts at one end, and they remain firm at the other, as it was in this. I could have rais'd ſeveral ſuch Splinters of this large Chip, ſome bigger and ſome leſs; and when ſo raiſed, they would have ſlap'd down as though they were a Spring. Some of thoſe Stones would appear at one end as if rotten, and decayed Wood; but trying it, it was as much Stone, as any other part.

Now as to the Lake itſelf, it is reputed to be twenty four Miles long, and twelve Miles broad, and Navigable from *Charlemount* to *Portlenone*, which is about thirty five Miles. It does not abound with many ſorts of Fiſh, but thoſe that are are very good, ſuch as Salmon, Trout, Pike, Breame, Roch, Eels and Pollans, with which laſt it does abound: The *Engliſh* call them freſh water Herrings, for want of another Name; for Pollan is an *Iriſh* Name. They catch them in the Summer with Sieves, as they do Herrings, and they are a great Relief to the Poor, being very cheap: They are much in ſhape and bigneſs like to the largeſt Smelts, full of very large bright Scales, and pleaſant Meat, being eat freſh. Theſe were ſuppoſed to be a peculiar Fiſh to that Lake; but ſince I came here, I find *Lough Earne* has the ſame ſort, but not in ſo great Plenty. They are generally caught here in their Eel-Nets, running to the Sea; ſo that I am of Opinion, that they are that ſort of Fiſh which is caught in the Sea, or between the freſh and Salt-water, called Shads; and that the large ones come from the Sea, as the Salmon doth, and leave their Spawn in the *Lough*; which, when they grow to be big, go to the Sea, and there come to their full Growth: And that which confirms me in my Opinion is, that at the Salmon-fiſhing at *Colraine*, they catch many of the large ones going up to the *Lough*. There is one ſort of Trout in *Lough Neagh* very large: I have ſeen one weigh thirty Pound weight; and the largeſt Salmon that I ever ſaw weigh'd not more than thirty five. This ſort of Trout the *Iriſh* call a *Budagh*. That there is ſome healing quality in the Water of this *Lough*, is certain; but whether diffus'd through all Parts thereof is not known, nor pretended. There is a certain Bay in it, called the *Fiſhing-Bay*, which is about half a Mile broad: It is bounded by the School-lands of *Dungannon*, hath a fine Sandy Bottom, not a Pebble in it, ſo that one may walk with ſafety and eaſe from the Depth of his Ankle to his Chin, upon an eaſy Declivity, at leaſt three hundred Yards before a Man ſhall come to that Depth. I have been in it ſeveral times; and I have always obſerv'd, that as I have walk'd, the Bottom has chang'd from Cold to Warm, and from Warm to Cold, and this in different Spots through the Bay. Several have made the ſame Obſervation.

The firſt Occaſion of taking Notice of this Bay for Cure, happened to be no longer ago than in the Reign of King *Charles* the Second, and was thus. There was one Mr. *Cunningham*, that lived within a few Miles of the Place, who had an only Son grown to Man's Eſtate. This young Man had the Evil to that Degree, that it run upon him in eight or ten Places: He had been touch'd by the King, and all Means imaginable us'd for his Recovery; but all did no good, and his Body was ſo waſted, that he could not walk. When all Hopes of his Recovery were paſſed, he was carried to the *Lough*, where he was waſhed and bathed; and in eight Days time, bathing each Day, all the Sores were dry'd up, and he became cured, and grew very healthy, married, begot Children, and liv'd nine or ten Years after. After ſo remarkable a Cure, many came there, who had running Sores upon them, and were cured after a little time. Great Crowds come there of all ſorts of Sick; and ſick Cattle are brought there likewiſe and driven into the Water for their Cure; and People do believe they receive Benefit. I know it drys up running Sores, and cures the Rheumatiſm, but not with once bathing, as People now uſe it; and the drinking the Water I am told will ſtop the Flux. I look upon it to be one of the pleaſanteſt Bathing Places I ever ſaw.

XII. *Accounts of Books Omitted.*

1. Aloyſii Ferdinandi Comit. Marſigli Danubialis operis Prodromus. *n.* 276. *p.* 1038. Ad Regiam Societatem Anglicanam. Fol. 1700.

2. Dr. *Ehm*'s Treatiſe of St. *George*'s Bath, by *Landeck*, in the Lordſhip of *Glats* near *Sileſia*. *n.* 308 *p.* 2346.

CHAP. III.

Mineralogy.

I. *A Quarry of Marble in Ireland, by* Fra. Nevil, *Eſq*; *n.* 337. *p.* 278.

I Diſcover'd lately in the Mountains a Marble Quarry; the Country wherein it lies is ſo ſtrange for the natural Wonders in it, that it would make a little Hiſtory to deſcribe all that is to be ſeen. It lies on the Northſide of *Calcagh*, in the Pariſh of *Calaſher*, and County of *Fermannagh*. There are Marble Rocks, whoſe perpendicular height is 50 or 60 Feet diſcover'd by ſubterraneous Rivers, which by degrees, have waſh'd away the Earth and looſe Stones, and diſcover'd theſe mighty Rocks. There are a great many Pits fallen in on the ſides of the great Mountains; ſeveral of them in a ſmall Compaſs of Ground, ſo that 'tis dangerous travelling near them. There are many Caves form'd, ſome very large, the Sides and Arches of Marble: ſome of a Liver Colour, varied with white in many little Figures; ſome of a light blue, varied with white; but I could find no entire black or white among them.

Marble, &c. in Wales, *by Mr.* Lhwyd, *n.* 337. *p* 275

II. We have lately diſcover'd a new ſort of Marble in *Merionydſhire*, which when poliſh'd, repreſents a number of ſmall Oranges cut a croſs, the reaſon whereof is an infinite Quantity of *Porus* or *Alcyonium* ſtuck through the Stone. *Pembrokeſhire* and *Caermarthenſhire* afford great quantity of Allum, and *Merionydſhire* of Copperas; at the latter I ſaw a great Vein of Pyrites ſtrongly impregnated.

An Eruption of Mount Veſuvius *in* 1707. *by Sign.* Joſ. Valletta *n.* 337. *p.* 22.

III. *Anno* MDCCVII, cum jam æſtas ingraveſceret, in extremis menſis Julii diebus *Veſuvianus* mons, qui diu quieverat, aliqua motus ſigna edere incepit, nam interni mugitus primo auditi ſunt, qui in ipſo montis umbilico perſonabant, nullo tamen adhuc dato aut fumi aut flammæ indicio. Deinde paulatim poſt editos ſonitus fumum emittere & clarum ignem incepit, qui noctu præſertim toti Campaniæ illuceſcebat. Per varia interim intervalla bombos dedit adeo horriſonos, ut vix ipſis comparandi ſint crepitus e majoribus noſtri temporis tormentis bellicis eliciti: Inde cineres veluti ex materia jam pinſata interius volvere perſeveravit, per plures dies nocteſque eos undequaque volvens in cœlum elatos, & in varias regiones diſperſos, ſicuti ventus ſpirabat diverſus, modo in ſubjecta maria, modo in Stabianos, modo in Nolanos, & Acerranos agros eos ejiciens. Nec ſilentio prætereunda vehemens lapidum pluvia, quæ cum hominibus, tum jumentis exitio fuit. Poſt hæc liquidum bituminis flumen, quod glaream vocant, e patulo ore, uti alias, vomere incepit, quod ignitam primo torrentis placidi formam habebat, ea motus lenta celeritate ſe deorſum moventem, quam in pice liquefacta aut denſioribus aliis obſervamus. Hæc materies, quam vitro ex arena liquefacto compararem in ferventiſſimis fornacibus, item ac vitrum ubi procedens deferbuerat, lapideam duritiem acquirebat. Illud autem obſervatu dignum putavimus, quod ſuperior hujus materiei deferveſcentis ſuperficies in lapides minutos ſpongioſos ſe vertebat, inferior vero in ſolidum latiſſimum & duriſſimum ſilicem, quo in ſternendis viis ab antiquo utimur; quaſi quæ proxima aeri erat illius particulas retineret immiſtas, inferiore parte nullo inani admiſto in compactiſſimam maſſam coacta. Cæterum inter plurima montis efferveſcentis Phænomena duo certe fuere a multa ætate non viſa, & ignota: tertio namque die aut quarto, fulgetra emittere ex orificio cepit, ejuſdem fere aſpectus ac quæ e Cælo interdum micare videmus, ſed tortuoſa & ſerpentia, & in eorum emiſſione tonitruorum bombi audiebantur, ut Cælo tonante eadem timemus: fuere ea tam ſpiſſa & frequentia, ut primo quidem putaremus pluviam caſuram, uſquequo animadverſum eſt ea ex monte prodire, & obſcuras nubes non ex vaporum materia, ſed denſitate cineris cadentis compactas. Interea IV. Nonas Auguſti, quarta poſt meridiem hora, tanta ingruerat cineris

denſitas aerem Neapoli imminentem, ut excluſis radiis ſolaribus tenebræ undique ſint inductæ, & quidem ea obſcuritate, ut commeantes per urbem in ipſis compitis ſocios amicoſque agnoſcere non potuerimus. Nulla nox illo die nigrior; accenſis facibus ſi quis domo prodierat redire cogebatur, quod ſolum temporibus Titi accidiſſe ex Xiphilino accepimus. Tandem circa primam aut alteram noctis horam, ex Septentrionali parte, quam minor fortaſſe occuparat cinerum vis, unum aut alterum ſidus micare viſum eſt, & cærulea facies Cæli apparere, & inde ſenſim per noctem tenebræ minui viſæ ſunt, quæ diem prius oculis abſtulerant. Tum divino beneficio, ea cinerum materies averſo vento e noſtra regione ad mare ſubjectum perlata eſt. Dies ortus non jam adeo illuſtris, ſed reliquiis etiam cinerum per aerem interſperſis, ſemiclarus, & retinebat *dubiæ diſcrimina Lucis.*

Neapolitani demum metu levati, ut Divo *Januario*, præſenti eis ſemper in anguſtiis memoriam perpetuam ſtatuerent, eidem numiſma cudi curaverunt ex auro argentoq; ubi Divi Januarii caput cum hac epigraphe. *Divo Januario Liberatori Urbis & Fundatori Quietis*; & altera numiſmatis facie pacatus Veſuvius cum epigraphe: *Poſtquam collapſi cineres & Flamma quievit. Cives Neap. incolumes. A.* MDCCVII.

IV. *April* 17. 1717. I reach'd the top of Mount *Veſuvius*, in which I ſaw a vaſt Aperture full of Smoak, which hindred my ſeeing its Depth and Figure. I heard certain odd Sounds within, which ſeem'd to proceed from the Belly of the Mountain; a ſort of Murmuring, Sighing, Throbbing, Churning, Daſhing (as it were) of Waves, and between whiles a Noiſe like that of Thunder or Cannon, which was conſtantly attended with a Clattering, like that of Tyles falling from the tops of Houſes in the Streets. Sometimes as the Wind chang'd, the Smoke grew thinner, diſcovering a very ruddy Flame, and the Jaws of the Pan or Crater ſtreak'd with Red, and ſeveral Shades of yellow. After an Hours ſtay the Smoke being mov'd by the Wind, gave us ſhort and partial Proſpects of the great Hollow, in the flat Bottom of which I could diſcern two Furnaces almoſt contiguous; that on the left ſeeming almoſt three Yards in Diameter, glow'd with red Flames, and threw up red hot Stones with a hideous Noiſe, which as they fell back, caus'd the forementoin'd Chattering. *May* 8. in the Morning, I aſcended to the top of *Veſuvius* a ſecond time, and found a different Face of things; the Smoke aſcending upright, gave a full Proſpect of the *Crater*, which as I could judge, is about a Mile in Circumference, and an hundred Yards deep. A conical Mount had been formed ſince my laſt Viſit, in the middle of the Bottom. This Mount I could ſee was made of the Stones thrown up and fallen back again into the *Crater*. In this new Hill remained the two Mouths or Furnaces already mention'd; that on our left Hand was in the *Vertex* of the Hill which it had formed round it, and raged more violently than before, throwing up every three or four Minutes,

Another Eruption, in 1717. *by Mr.* Edw. Berkley, *n.* 354. *p.* 708.

nutes, with a dreadful Bellowing, a vaſt Number of red-hot Stones, ſometimes in appearance above a Thouſand, and at leaſt 300 Foot higher than my Head as I ſtood upon the Brink. But there being little or no Wind, they fell back perpendicularly into the *Crater*, increaſing the conical Hill. The other Mouth to the Right was lower in the ſide of the ſame new formed Hill. I cou'd diſcern it to be fill'd with red hot liquid Matter, like that in the Furnace of a Glaſs-Houſe, which raged and wrought as the Waves of the Sea, cauſing a ſhort abrupt Noiſe like what may be imagin'd to proceed from a Sea of Quickſilver daſhing among uneven Rocks. This Stuff wou'd ſometimes ſpew over and run down the convex ſide of the conical Hill, and appearing at firſt red hot, it changed Colour, and harden'd as it cool'd, ſhewing the firſt Rudiments of an Eruption, or if I may ſo ſay, an Eruption in Miniature. Had the Wind driven in our Faces, we had been in no ſmall Danger of ſtifling by the ſulphurous Smoak, or being knock'd on the Head by Lumps of molten Minerals, which we ſaw had ſometimes fallen on the Brink of the *Crater*, upon thoſe Shots from the Gulf at Bottom. But as the Wind was favourable, I had an opportunity to ſurvey this odd Scene for above an Hour and a half together; during which it was very obſervable, that all the Volleys of Smoak, Flame, and burning Stones, came only out of the Hole to our Left, while the liquid Stuff in the other Mouth wrought and overflow'd as hath been already deſcrib'd.

June 5. After a horrid Noiſe, the Mountain was ſeen at *Naples* to ſpew a little out of the *Crater*. The ſame continu'd the 6th. The 7th, nothing was obſerv'd till within two Hours of Night, when it began a hideous bellowing, which continued all that Night and the next Day till Noon, cauſing the Windows, and as ſome affirm, the very Houſes in *Naples* to ſhake. From that time it ſpew'd vaſt Quantities of molten Stuff to the South, which ſtream'd down the ſide of the Mountain, like a great Pot boyling over. This Evening I return'd from a Voyage thro' *Apulia* and was ſurprized, paſſing by the North-ſide of the Mountain, to ſee a great Quantity of ruddy Smoak lie along a huge Tract of Sky over the River of molten Stuff, which was it ſelf out of ſight. The 9th, *Veſuvius* raged leſs violently; that Night we ſaw from *Naples* a Column of Fire ſhoot between whiles out of its Summit. The 10th, when we thought all would have been over, the Mountain grew very outragious again, roaring and groaning moſt dreadfully. You cannot form a juſter Idea of this Noiſe in the moſt violent Fits of it, than by imagining a mix'd Sound made up of the raging of a Tempeſt, the Murmur of a troubled Sea, and the Roaring of Thunder and Artillery, confuſed all together. It was very terrible as we heard it in the further End of *Naples*, at the Diſtance of above twelve Miles. This moved my Curioſity to approach the Mountain. Three or four of us got into a Boat, and were ſet aſhore at *Torre del Greco*, a Town ſituate at the Foot of *Veſuvius* to the South-Weſt, whence we rode four or five Miles before we came to the burning River, which was about Mid-night. The Roaring of the

Volcano grew exceeding loud and horrible as we approach'd. I obſerved a Mixture of Colours in the Cloud over the *Crater*, green, yellow, red and blue; there was likewiſe a ruddy diſmal Light in the Air over that Tract of Land where the burning River flowed; Aſhes continually ſhower'd on us all the way from the Sea-Coaſt. All which Circumſtances ſet off and augmented by the Horror and Silence of the Night, made a Scene the moſt uncommon and aſtoniſhing I ever ſaw; which grew ſtill more extraordinary as we came nearer the Stream. Imagine a vaſt Torrent of liquid Fire rolling from the top down the Side of the Mountain, and with irreſiſtible Fury bearing down and conſuming Vines, Olives, Fig-trees, Houſes, in a Word, every thing that ſtood in its way. This mighty Flood divided into different Channels, according to the Inequalities of the Mountain. The largeſt Stream ſeem'd half a Mile broad at leaſt, and five Miles long. I walk'd ſo far before my Companions, up the Mountain along the ſide of the River of Fire, that I was oblig'd to retire in great haſte, the ſulphureous Steam having ſurpriz'd me, and almoſt taken away my Breath. During our Return, which was about Three-a-Clock in the Morning, we conſtantly heard the Murmur and Groaning of the Mountain, which between whiles would burſt out into louder Peals, throwing up huge Spouts of Fire and burning Stones, which falling down again reſembled the Stars in our Rockets. Sometimes I obſerv'd two, at others three diſtinct Columns of Flame, and ſometimes one vaſt one that ſeem'd to fill the whole *Crater*. Theſe burning Columns, and the fiery Stones ſeem'd to be ſhot a 1000 Foot perpendicular above the Summit of the *Volcano*. The 11th at Night, I obſerv'd it, from a Terraſs in *Naples*, to throw up inceſſantly a vaſt Body of Fire and great Stones to a ſurprizing Height. The 12th in the Morning, it darkned the Sun with Aſhes and Smoak, cauſing a ſort of Eclipſe. Horrid Bellowings this and the foregoing Day were heard at *Naples*, whither part of the Aſhes alſo reached. At Night I obſerved it throw up Flame, as on the 11th. On the 13th, the Wind changing, we ſaw a Pillar of black Smoak ſhot upright to a prodigious Height. At Night I obſerved the Mount caſt up Fire as before, tho' not ſo diſtinctly becauſe of the Smoak. The 14th, a thick black Cloud hid the Mountain from *Naples*. The 15th in the Morning, the Court and Walls of our Houſe in *Naples* were cover'd with Aſhes. In the Evening, Flame appear'd on the Mountain through the Cloud. The 16th, the Smoak was driven by a Weſterly Wind from the Town to the oppoſite ſide of the Mountain. The 17th, the Smoak appear'd much diminiſh'd, fat and greaſy. The 18th, the whole Appearance ended, the Mountain remaining perfectly quiet without any viſible Smoak or Flame. A Gentleman of my Acquaintance, whoſe Window look'd toward *Veſuvius*, aſſured me, That he obſerv'd this Night ſeveral Flaſhes, as it were of Lightning, iſſue out of the Mouth of the *Volcano*. It is not worth while to trouble you with the Conjectures I have formed concerning the Cauſe of theſe Phænomena, from what I obſerved in the *Lacus*

Amſancti, the *Solfatara*, *&c.* as well as in Mount *Veſuvius*. One thing I may venture to ſay, That I ſaw the fluid Matter riſe out of the Centre of the bottom of that *Crater*, out of the very middle of the Mountain, contrary to what *Borellus* imagines, whoſe Method of explaining the Eruption of a *Volcano* by an inflex'd Syphon, and the Rules of Hydroſtaticks, is likewiſe inconſiſtent with the Torrents flowing down from the very Vertex of the Mountain.

The Strata of a Coal Pit at Dudley *in* Staffordſhire, *by Mr.* Beller, *n.* 336 *p.* 541

V. 1. A yellowiſh Clay, which lies immediately under the Turf. 2. A Blewiſh Clay. 3. A Blewiſh hard Clay; the Miners call it *Clunch*. This is one of the certain Signs of Coal. It has in it Mineral Plants. 4. A Blewiſh ſoft Clay. 5. A fine-grained Gray Stone: It lies next the former, and is found in ſome Pits only. 6. A Clay almoſt like the firſt, only whiter. 7. A hard Gray Rock; with ſomething like the Impreſſions of Vegetables, but none diſtinct. 8. A Blew *Clunch*, like Numb. 3. with Mineral Plants in it. 8. +. This *Stratum* (which is the ſame with Numb. 13.) was not taken. 9. Coal, called *Bench-Coal*. 10. Coal, leſs black and ſhining than the former, called *Slipper-Coal*. 11. Coal, more black and ſhining, called *Spin-Coal*. 12. A Coal like *Cannal-Coal*, by the Miners called *Stone-Coal*. Theſe *Strata* of Coal have between each of them a *Bat*, of about the Thickneſs of a Crown Piece. 13. A black Subſtance, called the *Dun-Row-Bat*. 14. A hard grey Iron Oar, called the *Dun-Row Iron Stone*. 15. A blewiſh *Bat*, in which the following *Iron-Stone* lyes, called the *White-Row*. 16. A hard blackiſh Iron Oar, lying in ſmall Nodules, having between them a white Subſtance; and from thence by the Miners called the *White-Row-Grains*, or *Iron-Stone*. 17. A hard grey Iron Oar, with ſome white Spots in it, called the *Mid-row Grains*. 18. A black fiſſile Subſtance, called the *Gublin Bat*. 19. A hard blackiſh Iron Oar, with white ſpots in it, called the *Gublin Iron-Stone*. 20. A *Bat*, in Subſtance much like that of N°. 18. 21. A hard grey Iron Oar, called the *Cannoc*, or *Cannot-Iron-Stone*. 22. A *Bat*, ſomewhat harder than Numb. 20. 23. A dark, gray, hard Iron Oar, called the *Rubble-Iron-Stone*. 24. The *Table-Bat*, next under the *Rubble Iron-Stone*. 25. A coarſe ſort of Coal, called the *Foot-Coal*. 26. A black, brittle, ſhining *Bat*. 27. *The Heathen-Coal*. 28. A Subſtance like a coarſe Coal, but by the Miners called a *Bat*; perhaps becauſe it does not burn well. 29. The *Bench-Coal*. 30. A *Bat* under the laſt, and is as low (*viz.* 188½ Feet) as they generally dig, though there is a coarſe Coal under this.

N. B. Thoſe Subſtances, which divide the *Strata* of Coals and Iron Oars from each other, are called *Bats* by the Miners: They are generally black, conſiſting of a Matter peculiar to themſelves, and are of a Texture neareſt like *Marle*; tho' ſome of them are fiſſile, and others have a Subſtance not unlike Coal mixt with them.

2. *A Table of the Thickneſs of each* Stratum, *and its Proportion to Water, or Specifick Gravity.*

By Mr. Fra. Hawksbee.

Number of the *Strata*	Thickneſs of each *Strat.*		Proportion to Water,		Or Specifick Gravity.
	Feet.	Inches.			
i.	4	0	as 385	to 192	as 200to 100
ii.	5	0	296	168	176
iii.	24.	0	23	9	256
iv.	9	0	209	106	197
v.	4	0	583	237	246
vi.	21	0	401	192	209
vii.	75	0	683	259	243
viii.	5.	0	223	88	253
viii+.	1	0	—	—	—
ix.	3	0	7	5	140
x.	3	0	106	72	147
xi.	4	0	147	114	129
xii.	4	0	185	143	130
xiii.	1	0	408	198	206
xiv.	0	1	204	67	303
xv.	0	3	183	72	254
xvi.	1	3	325	232	334
xvii.	0	2	781	244	320
xviii.	2	0	305	129	236
xix.	0	9	920	266	346
xx.	1	6	192	76	253
xxi.	0	6	675	216½	313
xxii.	1	0	428	165	290
xxiii.	0	6	828	231	358
xxiv.	2	0	333	153	218
xxv.	1	0	198	154	128
xxvi.	6	0	238	141	169
xxvii.	6	0	298	236½	126
xxviii.	0	1	267	186	144
xxix.	2	0	314	240	131
xxx.	0	6	244	133	183

By which it is evident, that the Gravities of the ſeveral *Strata* are in no manner of Order; but purely caſual, as if mixt by chance.

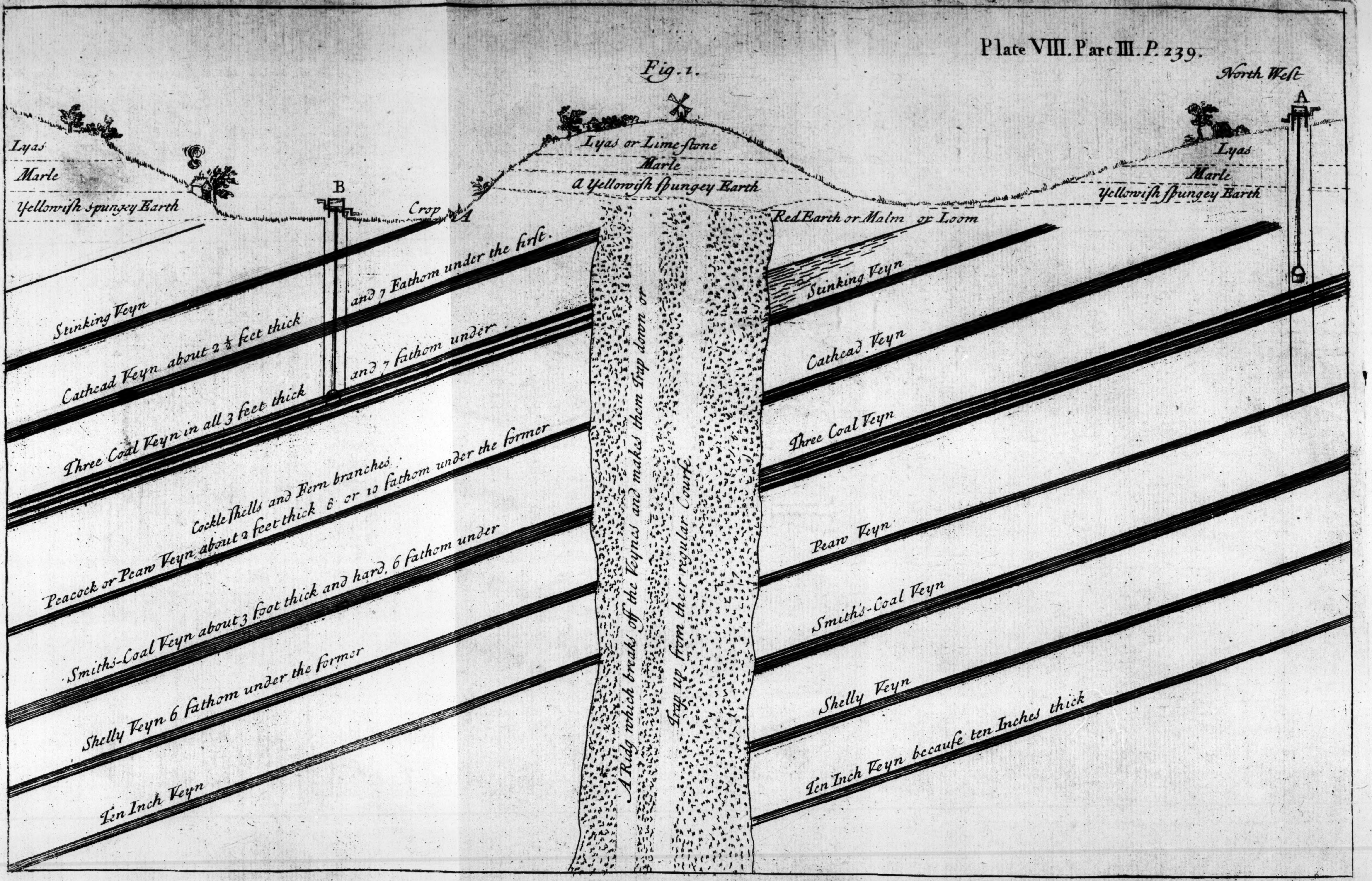
Of the Strata in the Coal Mines in Mendip Somerſetſhire, *by* Joh. Strachey, *Eſq; n.* 360. *p.* 968.

VI. The Draught you muſt ſuppoſe the Section of a Coal Country, and to take in about four Mile from N. W. to S. E. and may be applied to the Veins of Coal as they lie at *Faringdon Gourney*, and likewiſe at *Biſhop Sutton*, which laſt Place is near *Stowy*, but in the Pariſh of *Chew Magna* in *Somerſetſhire.* For diſcovery of Coals, they firſt ſearch for the Crop, which is really Coal, though very friable and weak; and ſometimes appears to the Day, as they term it; or elſe for the Cliff, which is dark or blackiſh Rock, and always keeps its regular Courſe as the Coal does, lying obliquely over it. For all Coal lies ſhelving like the Tile of an Houſe, not perpendicular nor horizontal, unleſs it be broken by a Ridge, which is a parting of Clay, Stone or Rubble; as if the Veins, by ſome violent Shock, were dis-jointed or broken ſo as to let in Rubble, &c. between them. The Obliquity or *Pitch*, as they term it, in all the Works hereabout, is about 22 Inches in a Fathom; and when it riſeth to the Land is called the *Crop*, but in the North *Baſſeting*. In the Works near *Stowy*, and likewiſe at *Faringdon* it riſeth to the North-Weſt, and pitcheth to the South Eaſt; but the farther they work to the South Weſt, the *Pitch* enclines to the South; and *e contra*, when they work towards the North-Eaſt. So likewiſe they obſerve, as they work to the South Weſt, when they meet with a *Ridg* it cauſeth the Coal to *trap up*, that is, being cut off by the *Ridg*, they find it over their Heads, when they are through the Ridge; but on the contrary, when they work through a Ridg to the *North Eaſt*, they ſay it *traps down*, that is, they find it under their Feet.

Coal is generally dug in Valleys or low Grounds. The Surface in theſe parts is moſtly a red Soyl, which under the firſt or ſecond Spitt degenerates into *Malm* or *Loom*, and often yields a Rock of Reddiſh *Fireſtone*, till you come to four, five, and many times to twelve or fourteen Fathom depth, when by degrees it changeth to a Gray, then to a dark or blackiſh Rock, which they call the *Coal Clives*. Theſe always lye ſhelving and regular as the Coal doth. But in theſe parts they never meet with *Fireſtone* over the Coal, as at *Newcaſtle* and in *Staffordſhire*. Theſe *Clives* vary much in Hardneſs, in ſome places being little harder than *Malm* or *Loom*, in others ſo hard as that they are forced to ſplit them with Gunpowder: So likewiſe in Colour, the top inclining to red or grey, but the nearer to Coal the blacker they grow; and whereſoever they meet with them are ſure to find Coal under them. But to their Diſappointment 'tis not always worth the digging. The firſt or uppermoſt Vein at *Sutton* is called the *Stinking Vein*. It is hard Coal fit for Mechanick Uſes, but of a ſulphurous Smell. About five Fathom and half, ſeldom more than ſeven Fathom under this, lyes another Vein, which from certain Lumps of Stone mixt with it like a *Caput mortuum* not inflamable, called *Cats-head*, they call the *Cathead Vein*. About the ſame Depth under this again lyes the *Three Coal Vein*, ſo called becauſe its divided into three different Coals; between the firſt and ſecond Coal is a Stone of a Foot, in ſome places two Feet thick; but the middle and third Coal ſeem placed looſe on each other, without any Separation of a different Matter. Theſe three Veins before-mentioned are ſometimes work'd in the ſame Pit: But the next Vein which I am going to mention is generally wrought in a ſeparate Pit; for tho' it lyes the like depth under the other, the *Cliff* between them is hard and ſubject to Water; wherefore I have repreſented a Pit ſunk through the three Up-

Plate VIII. Part III. P. 239.

Fig. 1.


North Weſt
A
B
Lyas
Marle
Yellowiſh ſpungey Earth
Crop
A
Lyas or Lime-ſtone
Marle
A Yellowiſh ſpungey Earth
Red Earth or Malm or Loom
Lyas
Marle
Yellowiſh ſpungey Earth
Stinking Veyn
and 7 Fathom under the firſt.
Cathead Veyn about 2½ feet thick
and 7 fathom under
Three Coal Veyn in all 3 feet thick
Cockle ſhells and Fern branches
Peacock or Peaw Veyn about 2 feet thick 8 or 10 fathom under the former
Smiths-Coal Veyn about 3 foot thick and hard, 6 fathom under
Shelly Veyn 6 fathom under the former
Ten Inch Veyn
A Ridg which breaks off the Veynes and makes them Trap down or
Trap up from their regular Courſe
Stinking Veyn
Cathead Veyn
Three Coal Veyn
Peaw Veyn
Smith's-Coal Veyn
Shelly Veyn
Ten Inch Veyn becauſe ten Inches thick

per Veins, at *A*, and another ſunk upon the *three Coal Veins* only at *B*. *Plate* 8. *Fig.* 1. and ſo if they ſink on any of the lower Veins they go more to the North Weſt.

Next under the *three Coal Veins* is the *Peaw Vein*, ſo denominated becauſe the Coal is figured with Eyes reſembling a Peacock's Tail, gilt with Gold, which Bird in this Country Dialect is called a *Peaw*. The *Cliff* alſo over this Vein is variegated with *Cockle-Shells* and *Fern Branches*, and this is always an Indication of this Vein, which, as I before hinted, is always ſearched for about 15 Fathom to the North Weſt of the former. Under this again between five and ſix Fathom lies the *Smith's Coal Vein*, about a Yard thick; and near the ſame depth under that again the *Shelly Vein*: And under that a Vein of 10 Inches thick, which being little valued, has not been wrought to any purpoſe. Some ſay there is alſo another under the laſt, but that has not been proved within Man's Memory. At *Faringdon* they have the ſame Veins, which as I am informed, agree in all Parts with thoſe of *Biſhop Sutton* before-mentioned. But as *Faringdon* lies four Miles South Eaſt from *Biſhop Sutton*, ſo, in the regular Courſe, they would lye a Mile and $\frac{1}{3}$ deeper than thoſe at *Sutton*. But as in Fact they are dug near the ſame Depth, it follows there muſt be a *Trap*, or ſeveral *Traps down*, which in all muſt amount to that depth between the ſaid Works. Between *Faringdon* and *High-Littleton* the ſame Veins ſeem to retain their regular Courſe; but at *Littleton* their undermoſt and deepeſt Vein is the beſt Coal, which at *Faringdon* proves ſmall.

On the other Hand, in the Pariſh of *Stanton-Drew*, to the North-Eaſt of the Coal-Works at *Sutton* aforeſaid, about a Mile diſtaut, and in the true Courſe with thoſe at *Sutton*, the ſame Veins are found again. But here they wind a little, and their Courſe or Drift runs almoſt North, and they dip to the Eaſt; which Wiudiug is attributed to *Ridges*, which the Workmen have met with on both Sides, and have occaſion'd them to diſcontinue the Work that way. At *Stanton* they have little of the red Earth or *Malm* on the Surface, but come immediately to an *Iron-Gritt* or *grey Tile-Stone*, which is a Fore-runner of the *Coal-Clives*; in all other Matters they agree with the Works near *Stowy*. A little to the Eaſtward, they have another Coal-work, but the Veins are in all reſpects different from the former. Their Drift or Courſe is to the 11 a-Clock Sun, as they term it, they *Pitch* to the 5 a-Clock Morning, and riſe to land conſequently to the five o'Clock Evening-Sun, They have ſeveral Veins, but as yet only three are thought worth working. The uppermoſt about three Feet thick ſmall *Lime Coal*: The next is about three Fathom under it, about two Feet and an half thick, fit for culinary Uſes: the undermoſt is about the like Depth under the former, only 10 Inches thick, but good hard Coal. At *Clutton*, about two Mile from theſe latter, in the ſame Drift, *viz.* almoſt to the South Eaſt and by South, theſe laſt Veins appear again. The Surface here is red, and ſo continues to ten, and ſometimes to fourteen Fathom, and in other reſpects agree with the laſt mention'd Works at *Stanton-Drew.* At *Burnet*, *Queen-Charlton*, and *Briſleton*, they have four Veins which Pitch to the North nearly, and conſequently the Drift lies almoſt Eaſt and Weſt. The Surface is red Land generally to the Depth of four or five Fathom. The uppermoſt is from three to ſix Feet thick at *Briſleton*, but leſs at *Charlton* and *Burnet*. The next called *Pot-Vein*, is ſix Fathom under the former, eighteen Inches thick, all hard Coal. *Thirdly*, The *Trench-Vein*, 7 Fathom under the other, which is from two Feet and half to three Feet thick, all ſolid Coal. *Fourthly*, *Rock-Vein*, always diſtinguiſhed by a Rock of Paving-Stone, called *Penant*, lying over it, which Rock is ſometime twenty Feet thick, or more, and therefore this Vein is never wrought in the ſame Pit with the former Vein, but about 200 Yards more to the South, or to Land, as they term it. It's computed ſeven Fathom under the former.

This is all I can ſay in relation to the different Veins of Coal and Earth in the Coal works in theſe Parts; wherein all agree in the oblique Situation of the Veins; and every Vein hath its *Cliff* or *Clives* lying over it, in the ſame oblique manner. All of them Pitch or Riſe about twenty two Inches in a Fathom, and almoſt all have the ſame *Strata* of Earth, Malm, and Rock over them, but differ in reſpect to their Courſe and Drift, as alſo in Thickneſs, Goodneſs and Uſe. Now as Coal is here generally dug in Valleys, ſo the Hills which interfere between the ſeveral Works before mentioned, ſeem alſo to obſerve a regular Courſe in the Strata of Stone and Earth found in their Bowels; for in theſe Hills (I mean thoſe only that are diſpers'd among the Coal-Works before mention'd) we find on the Summets a ſtony Arable mixt with a ſpongy yellowiſh Earth and Clay; under which are Quarries of *Lyas* in ſeveral Beds to about 8 or 10 Foot deep, and 6 Feet under that through yellowiſh Loom, you have a blue Clay, inclinable to Marle, which is about a Yard thick. Under this is another Yard of whitiſh Loom, and then a deep blue Marle ſoft, fat and ſoapy, 6 Feet thick; only at about two Feet thick, 'tis parted by a Marchaſite about 6 Inches thick. Theſe Beds of Stone and Marls different from Coals, lie all Horizontal.

A Colliery blown up near Newcaſtle, *com. by Dr.* Charlett, *n.* 318. *p.* 215.

VII. On *Wedneſday* the 18th Day of *Auguſt* laſt, at *Fatfield*, in the Pariſh of *Cheſter Le Street*, about three of the Clock in the Morning, by the ſudden Eruption of a violent Fire, which diſcharged it ſelf at the Mouths of three Pits, with as great a noiſe as the firing of Cannon, or the loudeſt Claps of Thunder, threeſcore and nine Perſons were deſtroyed in one inſtant. Three of them, *viz.* two Men and a Woman were blown quite up from the bottom of the Shaft, fifty ſeven Fathom deep into the Air, at a conſiderable Diſtance from the Mouth of the Pit. One of the Men with his Head almoſt off, and the Woman with her Bowels hanging about her Heels. The Engine, by which the Coals were drawn up, and is of a great weight, was removed and caſt aſide by the force of the Blaſt; and what is more wonderful, the Fiſh, which were in the Rivulet, that runs twenty Yards under the Level, and at as great a diſtance from the Mouth of one of the Pits, were in great Numbers taken up dead, floating upon the Water, by ſeveral of the Inhabitants. For ſeveral Days a very ſtrong and noiſome Shell continued to come out of the Pits. I ſhall endeavour to make the beſt Conjecture of the Cauſe of it, that I can draw from the Report or Experience of the Men entruſted with the Management of the Colliery, who being above Ground that Morning, ſhared not in the common Calamity. In order to which I muſt acquaint you with the Nature of Coal Mines, which are in general ſubject to Stith or Sulphur.

Stith, as vulgarly ſo called by the Pitmen, I think corruptly from Stench or Stink, is a want of Air, or rather ſuch a Foulneſs in the Air, that overcomes the Spirits of the Men, and ſo ſuffocates them, as well as extinguiſhes the Candles.

Sulphur differs in this, that as the other ſuffers not the Candles to burn, this makes them burn too faſt; and the Flame by the impulſive Quality of the Air, or attracted by the Sulphur, extends it ſelf upwards into a prodigious length, and as a Match lighted for the Diſcharge of a Cannon, as ſpeedily ſets on Fire that Vapour, equally deſtructive.

Now to prevent both theſe Inconveniences, as the only Remedy known here, the Viewer of the Works takes the beſt care he can to preſerve a free Communication of Air through all the Works; and as the Air goes down one Pit, it ſhould aſcend another; but it happen'd in this Colliery, that there was a Pit which ſtood in an Eddy, where the Air had not always a free Paſſage, and which in hot and ſultry Weather was very much ſubject to Sulphur: and it being then the middle of *Auguſt*, and ſome Danger apprehended from the Cloſeneſs and Heat of the Seaſon, the Men were with the greateſt Care and Caution withdrawn from their Work in that Pit, and turn'd into another: but an Overman, ſome Days after this Change, and upon ſome Notion of his own, being induc'd as is ſuppos'd, by a freſh cool, froſty Breeze of Wind, which blew that unlucky Morning, and which always clears the Works of all Sulphur, had gone too near that Pit, and had met the Sulphur juſt as it was purging, and diſperſing it ſelf, upon which the Sulphur immediately took the Fire by his Candle, and ſo he prov'd the Occaſion of the Loſs of himſelf and ſo many Men; and of the greateſt Fire ever known in theſe Parts.

Experiments upon Metals, made with the Burning Glaſs of the Duke of Orleans, *by Monſieur* Geoffroy, *n.* 322. *p.* 374.

VIII. The Burning-glaſs is three Foot in Diameter; it collects the Rays of the Sun at ten Foot diſtance, where it forms a Focus of about three Inches over, which is again contracted by means of another Glaſs-Lens to an Inch Diameter, and conſequently is render'd three times as ſtrong. What was a great hindrance to me in making theſe Experiments in the Focus of the Glaſs, was the difficulty I had to find any Matter capable of holding the Metals in Fuſion.

Charcoal, which is commonly made uſe of, is indeed a very proper Subſtance; but it is impoſſible with it to vitrify any one of the Metals: The Particles of the Metal, when held any long time in Fuſion in the Focus of the Glaſs, diſſipate and fly away in Fume or ſmall Particles; and as long as any part remains, that little that does remain, is always Metallick, until the whole be quite evaporated. The reaſon of which I take to be this. Charcoal is a ſubſtance deeply impregnated with oily or ſulphurous Parts (if I may ſo call them.) The firſt Effect that Fire has upon Metals is to ſeparate the ſulphurous Parts: now, if in Proportion as the Sulphur is ſeparated from the Metal, the Body that ſupports the Metal furniſhes it anew with other ſulphurous Parts, the other Principles will never ſeparate, and the Metal will always remain Metal. And nothing but the greateſt degree of Fire can raiſe and ſeparate the Sulphur, and that but by little and little, and in very ſmall Particles.

Of all the different ſorts of Matter that I made Tryal of, what ſeem beſt were the common Coppels and Plates of gray Fire-ſtone. The Coppels hold the Metal a long time in Fuſion in the Focus of the Glaſs without melting; excepting Lead, which eaſily runs through them as ſoon as it vitrifies, and helps to diſſolve them. The Plates of Fire-ſtone bear the heat of the Focus much longer than other Matter; but great Care is to be taken in heating them without breaking, 'till they become red-hot, and when they are hot, the leaſt cold Air makes them melt. Nevertheleſs this is the only ſubſtance that I have uſed with moſt Succeſs, to hold Metals a long time in Fuſion, tho' with the greateſt Caution that was poſſible, to avoid the Inconveniences aforemention'd.

Of Iron.

I placed in the Focus of the Burning-glaſs a piece of forged Iron of about a Drachm weight: It turn'd red hot, and its ſurface was covered with a black Matter like Pitch or Tar. If one withdraws the Iron out of the Focus in this State, this Matter fixes it ſelf on the ſurface of the Metal, and there forms a ſmall Skin or very fine blackiſh Scale, which is commonly very eaſily ſeparated by ſtriking upon it; and that part of the Iron that was cover'd with this Scale appears blacker than ordinary. This Scale is ſome of the ſulphurous part of the Iron that riſes to the ſurface of the Metal when it is ready to melt, and there remains for ſome time before it exhales. It is plainly this ſulphurous part that riſes upon Iron and poliſh'd Steel when heated, and gives them all thoſe different Colours, from a yellow to a Violet, Water-colour or black. If one continues to hold this piece of Iron on the Charcoal, it intirely melts; and at the ſame time caſts forth very bright Sparks in a great quantity, ſometimes to above a Foot diſtance from the Coal. If one ſaves what flies off during this ſparkling, by holding a Sheet of Paper under the Coal; we find that they are ſo many very ſmall Globules of Iron, and the greateſt part of them hollow.

All the Iron that is held in Fuſion upon the Coal, flies away in ſparkles after this manner, 'till none remains. Sometimes the Metal leaves off ſparkling, when the Coal is in part conſumed, and cover'd with a Bed of Cinders, upon which lies the melted Iron. For as the ſparkling of the Iron ſeems to me to proceed from nothing but the oily parts of the Coal acting upon thoſe of the Metal, the Cinders hinder this Oil from paſſing from the Coal to the Iron, ſo that it remains quietly in Fuſion. But if through any ſhake, or the like Accident, the Cinders are ſo removed that the Iron comes to touch immediately the Coal, it will begin to ſparkle afreſh. Sometimes the Heat that keeps in Fuſion the Metal, vitrifies alſo the Cinders; and this vitrified Matter mixing with the Metal makes a conſiderable Ebullition. If one at this inſtant withdraws the Metal out of the Focus, it appears half vitrified, or reduced to a blackiſh friable Maſs. Othertimes this vitrified Matter ſwims on the ſurface of the Metal, and there forms it ſelf into Drops, that are ſometimes clear and tranſparent, and other times opake, according as it is more or leſs mixed with the Metal. If after having let the melted Iron cool upon the Coal, one expoſes it again to the Focus of the Glaſs upon the Stone, it ſparkles afreſh till it is all conſumed; which common Iron will not do, that has not been expoſed to the heat of the Focus upon Charcoal. This Sparkling probably proceeds from the ſudden Rarifaction of the oily parts of the Coal, with which the Pores of the Iron are ſo plentifully ſaturated; or perhaps it may be cauſed by the Salts of the Iron acting on the Oil of the Coal.

I expoſed to the Focus, upon a Stone-ſlate, Iron and Steel: they grew red hot, and melted without crackling or caſting off any Sparks: they ſmoak'd very conſiderably, and the melted Metal turned by little and little like an Oil. After having withdrawn this melted matter out of the Focus, it fix'd in a Regulus like friable Maſs, and appear'd ſometimes lightly ſtriated, or ſhot into ſharp Points like Needles. Tho' this matter does not appear at all tranſparent, yet we may look on it as the beginning of Vitrification, or a middle ſtate between Metal and Glaſs; for it would vitrify in the end like other Metals, if one could hold it a ſufficient time in the Focus without melting or mixing with what ſuſtains it: But continuing it long in the Focus, the extream Heat of the Sun, that is neceſſary to keep it in perfect fuſion, melts likewiſe the Stone or Coppel that contains it, the reſult of which mixture is a brown or greyiſh ſort of Enamel. We may then take this Regulus Maſs to be a half vitrify'd Iron, by reaſon it is depriv'd of great part of its Sulphur. If one adds to this Maſs a Sulphur like that which was taken from it, from being friable it turns very hard and malleable; and the dulneſs it had before, changes to the brightneſs of a Metal. This is what I have experienced in expoſing again this matter to the Focus upon Charcoal: it melts, and ſo continues a conſiderable time in fuſion without ſparkling, but at laſt it ſparkles with the ſame briskneſs as Iron itſelf; and when withdrawn from the Focus, appears nothing different from melted Iron.

It appears from theſe Experiments, that Iron contains a ſulphur or oily Subſtance, that renders it bright, malleable, and eaſy to melt. That this Sulphur is raiſed by the Fire of the Sun, when the Metal is for ſome time held in fuſion in the Focus of the Glaſs. That it may be raiſed by the flame of common Fire, which though not ſtrong enough to melt the Iron, yet is able to reduce it to an Eſchar or ſort of Ruſt. That Iron deprived of this ſulphurous part, melts into a Regulus, or brittle and friable Maſs, in colour much like Antimony. That if one can hold a ſufficient quantity of this Matter long enough in the Focus by it ſelf, without melting or mixing with the Body that contains it, it perfectly vitrifies. That this Glaſs or metallick Regulus, with the help of a little Oil, returns to its former ſtate of a Metal. That it reaſſumes this metallick Form upon Charcoal, by drawing thence this oily Subſtance. That in ſhort, This oily part contained in the Coal, is little different from the Sulphur of Iron. Nevertheleſs we muſt imagine it to differ in ſome Particulars; in that melted Iron, that has been ſaturated with it, crackles and ſparkles very much when melted again upon the Stone or Coppel. Iron being the only Metal in which I have obſerved this ſparkling, I take it to be a Property peculiar only to Iron and not to any other Metal. Perhaps we may attribute it to the vitriolick Salt that this Metal ſo plentifully abounds with, which is very greedy of Sulphurs. To this ſame Greedineſs alſo, with which the vitriolick Salt of Iron abſorbs the oily part of the Coal, we may attribute the eaſineſs with which Iron conſumes the Coal; for there is no other Metal that ſo ſoon waſts the Coal in the Focus of the Glaſs, as Iron does. Iron is the only one of the four imperfect Metals, on which vitrified Drops ariſe while it is in fuſion upon the Coal.

Of Copper.

Copper expoſed to the Focus of the Burning-glaſs, at firſt turns white on its ſurface, and afterwards grows black, and is covered with a kind of Skin, or black furrow'd and uneven Scales, till at laſt it quite melts. I have withdrawn this Metal out of the Focus as ſoon as this white colour has appear'd, and after it has been cold, found nothing extraordinary on its ſurface, which has again by little and little recover'd very near the ſame colour as it had before. I have not been able to diſcover from whence this white colour proceeds; unleſs we may attribute it to ſome Volatile Arſenical Salt contained in the Copper, and driven by Extremity of heat to the ſurface of the Metal; or whether it purely proceeds from the Alteration that is made in the groſſer parts of the ſurface of the Metal when it begins to melt. The black colour that Copper afterwards takes, ſeems to be cauſed by the ſulphurous Matter that melts firſt in Metal as well as Iron, and is raiſed to its ſurface by the extream Heat.

I placed a piece of Copper in the Focus upon Charcoal: It melted, and emitted a very thin Fume, and by little and little diminiſhed till it was all evaporated.

I put a piece of red Copper on a Coppel into the Focus of the Glaſs: it melted, and ſent forth ſome thin Fumes; and after it had been ſome time in fuſion, it turn'd Liquid like an Oil. I withdrew this melted Matter, and as it grew cold, it fix'd into a Regulus of a reddiſh brown colour, which was hard, brittle, and not ductile under the Hammer. If one breaks it, it turns into a red Powder like Cinabar of Antimony; and when view'd with a Microſcope, appears ſo many little, red, tranſparent Grains like ſmall Rubies; inſomuch that one would readily take this Regulus to be a deep colour'd red Glaſs. I endeavoured to make this vitrified Copper ſpread abroad in melting, by mixing it with common white Glaſs; for which end I powder'd ſome of this vitrified Copper and common Glaſs, and mixing them melted them together; but the Mixture when in fuſion took at firſt a beautiful green colour, and continuing it longer in the Focus, it turn'd blewiſh. I believe we may attribute this change of Colour to the Alcali Salts of the Glaſs acting on the Particles of Copper; for thoſe Salts uſually draw a green or blewiſh Tincture from this Metal.

To preſerve therefore this red Colour of the vitrified Copper, when mix'd with common Glaſs, I made uſe of this Expedient. I melted in the Focus upon a Coppel a piece of Copper, and as ſoon as it began to vitrify I caſt upon it ſome common Glaſs; as ſoon as the Glaſs was melted I took them together out of the Focus without confuſing them; and as ſoon as they were cold, ſeparated the Regulus from the Glaſs as well as poſſible; and pick'd out of it ſome pieces of the Glaſs, loaded with ſome very ſmall red tranſparent Particles of the Regulus. This vitrified Copper is then nothing but Copper deprived, by means of heat, of the ſulphurous part, that gave it the form of a Metal. A Proof that this metallick form proceeds from nothing elſe but this Sulphur, is, That if one expoſes this vitrified Copper to the Focus upon Charcoal, it reaſſumes in a little time the Colour and Conſiſtence of melted Copper; and as it grows cold, fixes into a good red malleable Copper, as fine and hard as it was before it was vitrified.

It follows from theſe Experiments, that the Baſis of Copper is a red Earth ſuſceptible of Vitrification. That this Earth receives its metallick Form from a ſulphurous ſubſtance, in appearance no ways different from the Oil of Vegetables or Animals. That one may deprive Copper of this Oil, by holding it long enough in the Focus, or by calcining it in the Flame of common Fire. That Charcoal reſtores again this oily Part to Copper, and at the ſame time its metallick Form. It appears further, that the Oil of the Coal has not ſo conſiderable an effect upon Copper, as it has upon Iron.

Copper expoſed a long time to the Focus upon a Stone or Coppel, fumes very much, and diminiſhes in weight very conſiderably. I don't think that this fume is only the ſulphurous part of the Metal, the Evaporation of which muſt be inſenſible; but I believe that with this Oil there is mixed a great deal of the earthy, vitrifiable part of the Metal, which the heat of the Sun ſublimes and raiſes in Flowers.

Of Tin. Tin expoſed upon Coal to the Focus of the Burning-glaſs, melts, and emits a groſs, white, thick Fume, until it is all conſumed in Vapours. If one melts Tin upon a Coppel in the Focus of the Glaſs, it fumes very much, and its ſurface is cover'd with a white rarified Calx; on which by little and little ariſes a Tuft, or heap of ſharp, needle-like, tranſparent, chriſtalline Particles, conſiſting of an infinite number of ſmall Points. If one continues to hold this Maſs in the Focus upon the Stone, theſe Chriſtals at length leave off fuming, and remain fixt, while the Stone melts and vitrifies.

I took Calx of Tin, which is Tin reduced to a grey Powder by means of Fire, that has taken away by Calcination great part of its oily Subſtance, and expoſed it on a Coppel to the Focus, where it fumed again very much, and was reduced into ſharp chriſtalline Particles conſiſting of other ſmall Points. In re-expoſing theſe chryſtalline Particles to the Focus upon Charcoal, they melted very eaſily, and took again the form of Tin; the Coal having furniſhed them with the ſulphurous part that the Fire had before taken away. Every body knows, that if one adds any Fat, or the like inflammable Matter, to the Calx of Tin when red hot in the Crucible, it reaſſumes immediately the form of Tin.

Theſe Experiments ſhow, that Tin contains Sulphur that is very eaſily ſeparated, ſince common Fire can do it ſo readily; and that this Metal calcined, or depriv'd of its Sulphur, is eaſily ſaturated again with it from the oily part of any inflammable Matter whatſoever. It proves alſo, that the metallick Earth which is the Baſis of Tin, is a Chriſtalline Earth, very difficult to be melted; ſince common Fire cannot vitrify this Metal by it ſelf, and that the heat of the Sun, in the Focus of this large Burning-Glaſs of the Palace Royal, cannot perfectly melt the Calx into which this Metal is reduced. We may preſume that the Chriſtalliſation, or reducing of this Metal into ſharp-pointed Particles, proceeds from the force of the Sun's breaking and melting together into a Sodder (if I may ſo ſpeak) ſome of theſe ſmall Chriſtals, by degrees as the ſulphurous part leaves them; it not being ſtrong enough to melt them all down together in one intire Maſs.

Of Lead. I took Lead, and held it in fuſion upon Charcoal in the Focus of the Glaſs: it all waſted away in abundance of Fumes. I expoſed the like quantity of Lead upon a Stone to the Focus, where it caſt forth great quantities of Fumes, and by little and little changed into a fluid Liquor like Oil or melted Roſin. This Liquor, as it grew cold, fix'd into Glaſs; which has this peculiar to it ſelf, that it is diſpoſed into Plates like *Venetian* Talk, and that it is flabby, ſoft to the touch, tranſparent, and in ſome parts of a greeniſh or reddiſh yellow. In continuing this matter in the Focus, it ſpread upon the Stone like Varniſh; and at laſt penetrating it, help'd to melt it. I placed this talky Earth in the Focus upon Charcoal: It melted, and in a little time after reaſſumed the form of melted Lead. I withdrew it from the Focus, and having let it cool, found it nothing different from Lead.

Theſe Experiments ſhow, that there is in Lead, as well as the other imperfect Metals, a ſulphurous part, that is eaſily ſeparated by common Fire or the heat of the Sun; and that this Metal has for its Baſis a foliated or talky Earth.

Of Quickſilver.

I placed Quickſilver in the Focus of the Burning-glaſs upon Charcoal, upon the Coppel, and upon the Stone: It all immediately diſperſed, and exhaled in a very thick Fume. I expoſed upon the Stone to the Focus ſome *Mercury precipitate per ſe*, in a degree of heat equal to that of Digeſtion: It ſeem'd to melt, but preſently diſperſed in Vapours: only there remained a ſmall quantity of a very rarified Duſt, like a Froath or Scum; but continuing it in the Focus, it melted, and gathered into a yellowiſh Glaſs, in which one might diſtinguiſh ſome Particles of Metal like Silver. I expoſed ſome Mercury *Precipitate per ſe* upon Charcoal: It fumed very much; and as it melted one might ſee little Globules of Mercury unite and form themſelves together upon the Coal, but they diſperſed again preſently in Vapours.

Theſe Experiments ſeem to prove, that there is in Quickſilver a Sulphur that may be ſeparated by a very gentle heat, ſuch as that of Digeſtion. That as ſoon as this Sulphur is taken away, its loſes its Fluidity and Brightneſs. That the Baſis of Mercury is a Calx, or red Earth. That this Calx does not melt into Glaſs as the Calx of other Metals, becauſe it is too Volatile, and as ſoon as it melts is evaporated by the heat. That if one reſtores to this Calx a Sulphur, by expoſing it again to the Focus upon Charcoal, it reaſſumes immediately its metallick Brightneſs and Fluidity, and becomes Quickſilver.

The Reſult of all theſe Experiments is, That theſe four Metals which we call imperfect, *viz.* Iron, Copper, Tin, and Lead, are compoſed of a Sulphur or oily Subſtance, and of a metallick Earth capable of Vitrification. That from this Sulphur proceeds the Opacity, Brightneſs, and Malleability of a Metal. That this metallick Sulphur does not appear at all different from the Oil of Vegetables or Animals. That it is the ſame in Mercury as in the four imperfect Metals. That theſe four Metals have for their Baſis an Earth ſuſceptible of Vitrification. That this Earth is different in every one of theſe four Metals; in that it vitrifies differently in each of them. And that on this difference in Vitrifying depends the difference of Metals.

Experiments tried with Mr. Villette's *Burning Concave, by Dr.* Harris, *and Dr.* Deſagulier, *n.* 360 *p.* 976.

IX. This Miroir is a Concave 47 Inches wide, and ground to a Sphere of 76 Inches Radius, ſo that its Focus is about 38 Inches diſtant from the Vertex of the Glaſs. The Metal of which 'tis made, is a mixture of Copper, Tin and Tin-glaſs, whoſe Reflection has ſomething of a yellow Caſt; the Concave ſurface has ſcarce any Flaws, and thoſe very ſmall; but the Convex ſide, which is alſo poliſh'd, has ſome Holes in it.

Having held ſeveral Bodies in the Focus of that Miroir, we obſerv'd what happened to them whilſt expos'd to that great Heat; and with a half ſecond Pendulum took notice of the Time when any material Change happen'd to them. The Experiments were made from 9 to 12.

N°. 1. A red piece of a *Roman Patera*, which began to melt in 3' was ready to drop in 100.

2. Another black piece melted at 4" and was ready to drop at 64".

3. Chalk taken out of an *Echinus Spatagus* fill'd with Chalk only, fled away in 23″.

4. A Foſſile Shell calcin'd in 7″ and did no more in 64″.

5. A piece of *Pompey*'s Pillar at *Alexandria* was vitrified in the black part in 50″ and the white part in 54″.

6. Copper Ore, that had no Metal in it viſible, vitrified in 8″.

7. Flag or Cinder, of the ancient Iron Work, ſaid to have been wrought by the *Saxons*, ready to run in 29″ $\frac{1}{2}$. Here the Glaſs growing hot, burn'd with much leſs Force.

8. Iron Oar fled at firſt, but melted in 24″.

9. Talk began to calcine at 40″, and held in the Focus 64″.

10. *Calculus humanus* in 2″. was calcin'd, and only dropt off in 60″.

11. An Anonymous Fiſh's Tooth, melted in 32″ and $\frac{1}{2}$.

12. The *Asbeſtos* ſeem'd condens'd a little in 28″, but 'twas now ſomething cloudy. Monſieur *Villette* ſays, The Glaſs uſually calcines it.

13. A golden Marchaſite broke to pieces, and began to melt in about 30″.

14. A Silver Six-pence melted in 7″ and $\frac{1}{2}$.

15. A King *William*'s Copper Half-penny melted in 20″, and ran with an Hole in it in 31″.

16. A King *George*'s Half-penny melted in 16″, and ran in 34″.

17. Tin melted in 3″.

18. Caſt Iron in 16″.

19. Slate melted in 3″, and had a Hole in 6″.

20. Thin Tile melted in 4″, had a Hole, and was vitrified through in 80″.

21. Bone calcin'd in 4″, and vitrify'd in 33″.

An Emerald was melted into a Subſtance like a *Turquois* Stone.

A Diamond weighing 4 Gr. loſt $\frac{7}{8}$ of its Weight.

Of Asbeſtos, and incombuſtible Cloth made of it, by Signior Campani, *n.* 273. *p.* 911.

X. Signior *Campani*, after ſome account of the Name of the *Asbeſtus* Stone, mentions four ſorts, of which he has Specimens in his *Muſæum.* The firſt ſent him from *Corſica* or *Corfu*, long, of a woody form, of half a Palm length and more, of a whitiſh colour, ſomething inclining to a reddiſh. The ſecond of a ſilveriſh Lead colour, ſofter and ſhorter, about three Inches, this was from *Seſtri di Ponente* in *Liguria.* The third (which is the worſt of all) is like Scales or *Laminæ* one upon another (as he repreſents it like an Onion) of a blackiſh earth colour, with ſome white, black and dark red Veins interſperſed, ſcarce two parts of an Inch *Roman* long, therefore fitter for making of Paper, than ſpinning or weaving. The fourth ſort, given him by Signior *Boccone*, found in the *Pyrenæans*, ſome whereof were a *Roman* Palm long; its Filaments, tho' longer, were yet thicker and rougher; he ſays alſo, That he heard of another ſort in *Volateranis Montibus.* Next he tells us, He kept it for three Weeks in a Glaſs-houſe Fire, but found it unaltered; but it would not preſerve a Stick wrapt in it from the Fire;

whence he concludes the *Amiantus* loſes nothing in the Fire, becauſe it does not burn nor flame, but in the handling it waſtes, though not much, as he found by an exact Ballance. Laſtly, He proceeds to ſhew the manner of ſpinning it, which he tryed thus; firſt he laid the Stone in Water (if warm the better) for ſome time to ſoak, then it is opened and divided with the Hands, that the earthy parts may fall out of it, which are whitiſh like Chalk, and hold the thready parts together; this makes the Water thick and milky; this is repeated ſix or ſeven times with freſh Water, where it is again opened and ſqueezed, till all the heterogeneous parts are waſhed out, and then the Flax-like parts are collected, and laid in a Sieve to dry.

Of his four ſorts of *Amiantus*, he found that from *Corſica* beſt, being long and ſoft; and the *Cyprian* worſt; where by the way he doubts whether his was of the beſt ſort, ſince the *Cyprian* was commended by *Pancirollus* and others which he quotes. But to come more cloſe to the way of ſpinning it, he firſt ſhews a Method diſcovered to him, which was thus. Lay the *Amiantus*, cleanſed as before, between two Cards, ſuch as they card Wool with, Fig. 15 and 16, where let it be gently carded, and then clapt up in between the Cards, ſo that ſome of it may hang out at the Sides, then lay the Cards faſt upon a Table or Bench, Fig. 17. Take a ſmall Reele, Fig. 18. made with a little Hook at the end, Fig. 19. and a part to turn it by, Fig. 20. ſo that it may eaſily be turned round, this Reele is to be wound over with fine Thread, then having a ſmall Veſſel of Oil ready, Fig. 21. with which the Fore-finger and Thumb are conſtantly to be kept wet, both to preſerve the Skin from the corroſive quality of the Stone, and render the Filaments thereof more ſoft and plyant: thus by twiſting the Thread upon the Reele about, with the *Asbeſtus* hanging out of the Cards, ſome of it will be worked up together with it; by little and little, this Thread may with care be woven into a coarſe ſort of Cloath, and by putting it into the Fire, the Thread and Oil will be burnt away, and the incombuſtible Cloath remain. But finding this way of uniting the Stone with the Thread very tedious, inſtead of the Thread he put ſome Flax upon a Diſtaff; and by taking 3 or 4 Filaments of the *Asbeſtus*, and mixing them with the Flax, he found they might eaſily be twiſted together, and the Thread thus made much more durable and ſtrong: So that there is no need of carding, which rather breaks the Filaments than does any good; open only and ſeparate the filaments after waſhing upon a Table, and take them up with the Flax, which is ſufficient. As to the making of Paper, he ſays in the waſhing the Stone, there will remain ſeveral ſhort pieces in the bottom of the Water, and of theſe after the common method Paper may be made. He concludes with the beſt way of preſerving the Cloath, or any other thing made of the Stone, when made, for by reaſon of its exceeding Dryneſs it is very apt to break and waſte; this is by keeping it always well oiled, which is the only preſervative for it; and when the Cloath is put in the Fire, the Oil burns off, and the Cloath comes out white and purified.

Plate 7.

Found in Scotland, *by Mr.* Wilſon, *n.* 276 *p.* 004.

2. In the Ground of *Francis Gordon* of *Achindore*, in the Shire of *Aberdeen*, near the *Highlands*, on the ſide of a Hill of a Heath-kind of Ground, ſomewhat inclining to what we call Moſs, in a very ſmall Brook, and hard by it, in the Bounds of ten or twelve Yards, I found a great many of theſe Stones, ſome a Foot in length, which appeared plainly like Wood: But becauſe I could not perceive any Footſtep of Wood thereabout, neither could any of them be found, except in that very ſpot of Ground, I could not be perſuaded they were petrified Wood. Then I went to cut up the Ground about the place with my Knife, where I found likewiſe ſome pieces of the Stone, and very near the ſuperfice I got ſeveral pieces of a fibrous matter, which my Knife could not cut; this I immediately judged to be an incombuſtible matter, as it proved afterwards when I tryed it by the Fire. And becauſe I thought it had been always eſteemed certain filaments that came off the *Lapis Amianthos*, I reſolved to obſerve more narrowly the Production of it.

When I found ſome pieces of the Stones very hard in the middle, and the fibrous matter on the outſides and ends, I was inclined to believe that the Flax came from the Stone: but then finding ſeveral pieces of the Flax ſo condenſed and preſſed together, that at firſt they appeared to be hard Stones, but being a little wet, the filaments were eaſily parted from one another. Many more I got, ſome leſs and ſome more condenſed, into the nature of a Stone; and all of it, both that which was condenſed together, and what was not, was lying about an Inch within the Ground, parallel with the ſurface ſo interwoven with the fibres of the Roots of the Graſs, that it ſeemed to me much more probable to believe, that the Lint turned into the Stone, than the Stone into the Lint: eſpecially ſeeing moſt part of the Stones appeared ſo tender and brittle on the outſide, that it's hard to believe how they could turn into that tough ſubſtance of Flax. The Stones are of different ſorts, ſome are white, the colour of the Lint, and of a very ſoft ſubſtance; ſo that they may be eaſily cut with a Knife without blunting it; others are much mixt with a whitiſh Talk, but moſt of them are of a greyiſh colour, and very hard.

As for the Production of the Flax, I think it's hard to determine in this place; becauſe the greateſt quantity I found of it, was lying, as I ſaid before, about an Inch at moſt within the Ground, parallel with the ſuperfice, interwoven with the Roots of the Graſs, without any Root of it ſelf, but alike at both ends, as if it were cut with a Knife. The Ground wherein it is found is of a greyiſh colour, about one Inch or two thick, under which there is a black Earth for a Foot in depth. So that I could find nothing in the places where moſt of it was got, that I could rationally conclude to produce it: But in ſome other Spots I found much of a talkiſh Sand, and ſome pieces of Flax near to it; as alſo pieces of the Stone much whiter than the reſt, and very like Talk; which would incline one to believe that it was produced of it. Yet there being no appearance of any talk in the other places, where moſt of it was found, I can ſcarce conclude any thing about the Production of it.

But whatever way it is produced, though I have not examined what has been writ and ſaid of that *Linum* by many, yet it ſeems to me by what *Pliny*, *Aldrovandus*, and *Olaus Wormius* write concerning it, that this which I found in *Scotland*, is not inferiour to any they ſpeak of, for generally they make it very ſhort, whereas ſome of this I found 5,6,7, and ſome 8 Inches long.

As for the making of it into Cloath, they all conclude it very hard, which I confeſs is true; yet it may be ſeen by the Experiment I have ſhown, in making Yarn of it, that Cloath may be made of it alſo, for the Difficulty is much greater in the one than the other.

A Relation of the ſame kind, by Dr. Blair, *n.* 333. *p* 434.

3. A ſingular kind of Stone was dug out of a Quarry in the Highlands of *Scotland*; which after the Rubbiſh, which lies not very deep, is done away, lies horizontally in a Bed endued with parallel Fibres, with few Interſtices, ſoft at the beginning, and eaſy to be ſmooth'd and poliſhed without any Tool, but rather with Sand, or another hard Stone of a blewiſh Colour, which afterwards hardens ſo, that it reſiſts the Injuries of the Air, or Prejudice of Fire. When firſt the Quarrier began to dig it, he was at a mighty loſs; for endeavouring to cut and raiſe it after the ordinary manner with Wedges, and other uſual Inſtruments, it broke and crumbled all to pieces: But afterwards, obſerving more narrowly the Duct of its Fibres, ſo to ſpeak, he endeavour'd to cut it with Spades lengthways; and by this means he procured Stones as big as he had a mind, which ſmoothed very eaſily along the Tract of their Fibres; but when cut tranſverſe, no Means nor Methods could render them ſmooth, but their ſurface remain'd unequal as the Extremities of a piece of Wood. Although as I ſaid, this Quarry has but few Interſtices, yet in thoſe it has the true *Asbeſtos*, of a whitiſh Silver Surface, conſiſting of ſeveral *faſciculi* with parallel Fibres, like to thoſe of the muſcular Fibres of ſalted Beef, eaſily ſeparable from each other, pure white, till it becomes ſo ſmall as the fineſt Flax, and ſo ductile, that it may be ſpun into the fineſt Thread, whereof it were eaſy to make the incombuſtible Cloth, ſo famous for Shrines among the Ancients. In other places of thoſe Interſtices, was likewiſe to be obſerved a reddiſh Subſtance, near to the colour of *Sanguis Draconis*; but whether Fibrous or not, I cannot inform you, ſince the Gentleman could not ſhew me any of it; but added, he believed it might be good for dying. I got a ſmall parcel of the *Asbeſtos* from him; and he told me, if he had known its value, he could have preſerv'd ſome Pounds of it. I am ready to think the ſecond kind was fibrous too, which might make a very beautiful Cloath, being ſtriped with the other. This whole Quarry may be ſaid to be *Asbeſtos* of different Colours, the blueiſh being of a much coarſer; and the white and red of a finer Grain.

The Icy Mountain Grindlewald, *by* William Burnet, *Eſq;* *n.* 320. *p.* 316.

XI. I went to the *Grindlewald*, a Mountain 2 Days Journey from *Bern*. There I ſaw between two Mountains, what one might call a River of Ice, which divides its ſelf in two Branches, and in its way from the top of the Mountain to the bottom, ſwells in vaſt heaps, ſome bigger than St. *Paul*'s Church. The Original of which ſeems to have been this. Theſe Mountains are cover'd all the Year with Snow on their Tops; this Snow has been melted in the Summer, and has fallen to the bottom, where the Sun never reaches: There it has frozen, which every body knows happens more eaſily to Snow than melted Water. Thus every Year it has encreas'd till it has touch'd the very top. The Reaſon why the Water has always frozen, though the Sun, in the middle of the Mountain and higher, ſhines upon it ſome part of the Day, is that the melted Water goes under the Ice already formed, and there freezes, and ſo expanding it ſelf raiſes the Ice above it, and ſometimes makes Cracks in it, that frighten the whole Neighbourhood. The reaſon appears plainly, becauſe the upper Surface being ſolid, cannot be dilated without making great Chinks, and that with a terrible Noiſe. They told me, upon the place, that every ſeven Years the Mountain increaſes, and the next ſeven decreaſes, but I doubt their Obſervation is not exact. If there is any ground for it, it ſeems to be that in the hot Summers it increaſes, and the more moderate ones it decreaſes, there being then leſs melted Snow, in which Caſe it is at preſent, as we know of late the Summers have been moderate.

See Phil. Tranſ. n. 49. *and* 100. *Abridg.* Vol. II. *p.* 465.

Obſervations on the Foſſils of Reculver Cliff, *by Mr.* Stephen Gray, *n.* 268. *p.* 762.

XII. 1. About a Mile from *Reculver*, towards *Herm*, there appears in the Cliff a *Strata* of Shells in a greeniſh Sand; they ſeem to be firm, and ſome of them are entire, but when you go to take them from their Beds, they crumble to Powder between your Fingers; but that which is moſt remarkable is, that in the lower part of the *Strata*, where the Shells are more thickly diſperſed, there lies ſcatter'd up and down Portions of Trunks, Roots and Branches of Trees; the Wood is become as black as Coal, and ſo rotten that large pieces of it are eaſily broken with ones Fingers. I know not what depth theſe may lye, the *Strata*'s ſurface not appearing above two Foot from the Beach, but I judge it from the ſuperficies or top of the Cliff about 12 Foot. I ſaw the Stump of one Tree ſtanding upright broken off about a Foot from the Ground. I ſhould have given a more particular account, but cannot at preſent find the Note I took upon the Place. I ſhall only add, That the Shells were of the white Conchites.

A Remark, by Sir Hans Sloane, *ib.*

2. It is very likely that the black Wood mentioned in this Letter is Oak, which has lain ſo long as to be turn'd of that colour by the Vitriolick Juices of the Earth, in which it has lain, as Galls and a Solution of Vitriol turn of that colour. I never ſaw any Oak that had lain any time in any kind of Earth, where Water came to ſoak into it, that was

not turned of that colour: and I have ſeen many Trees of black Wood of great bigneſs, taken up (as well as leſſer pieces) and all of it was Oak. It looks at firſt taking up like Ebony, is very ponderous, but as it dries, it ſplits, grows friable, light, and comes to be good for little.

Foſſils, by Mr. Edw Lhwyd, n.291.p.1566.

XIII. 1. The ſtate of theſe Bodies is quite different in your parts from what it is in *Wales* and *Ireland*. In thoſe Countries the Shells are generally *Cryſtalline*, but with you (and ſometimes hereabouts) they are *teſtaceous*: which difference is doubtleſs to be attributed to the Soil, and particularly to your Chalk and Flint, which all thoſe Countries want, excepting a ſmall part (I know not by what chance of *Diluvian Diſſolution*) got into the *North* part of *Ireland*. But there 'tis remarkable that their Chalk is abſolutely petrify'd: I mean, whereas the Flints are here imbodyed in Chalk, they are there in a Chalk-white *Lime-Stone*. And as your Chalky Countries only afford thoſe *Echinitæ* I have ſtil'd *Pileatus*, *Galeatus*, and *Cordatus*: So I could never find them in all my Travels but at that Place; from whence in the time of *Paganiſm* the *Druids* procur'd them, and ſold them amongſt our Northern *Britains* for Stones of miraculous Efficacy againſt Perils by Fire and Water; perſwading the Vulgar they were generated in *Cocks-knees*; as thouſands in the *High-Lands* believe at this Day. And one Fellow had the Impudence to tell me (finding me a little hard of Belief) that he himſelf had taken one (that his Maſter had ſhew'd me) out of a Cock's-knee with his own Hand.———

ib. p. 1567.

2. We were ſurpriz'd at *Oxford*, to find ſo many *Foſſils*, ſcarce diſtinguiſhable from *Sea Shells*: for the Caſe is otherwiſe in thoſe Places I ſearched. We have indeed in theſe Parts one or two *Foſſil Shells* of a *Teſtaceous* Subſtance; but in colour they recede farther from thoſe of the Sea than yours. I find by thoſe ſent me, that you ſometimes find them imbedded in ſolid Stone: which takes off any Objection ſome might offer, of their being an accidental ſcattering of *Gulls*, *Crows*, &c. on the *Harwich Cliffs*.

Of Harwich Cliffs and Foſſils there, by Mr. Sam. Dale, ib. p. 1568.

XIV. *Harwich* Cliff is a ſort of *Promontory*, which divides *Orwel Haven* from the *Æſtuarium* contained between that and *Walton Naſe*; it is ſituate on the Southern part of the Town, about a quarter of a Mile diſtant or not ſo much, and contains many Acres of Land. The height of it from the Strand or black Beach to the top, where it is higheſt, is 40 or 50 Foot. At the bottom of this Cliff, there is a *Stratum* of Clay about a Foot thick, which is ſucceeded by another of Stone for a Foot more; in this *Stratum* of Stone are imbedded divers Shells (tho' but thinly) as well of the *Turbinate* as *Bivalve* kind, and alſo pieces of Wood and Sticks, as you may obſerve by the Fragments thereof, which I have ſent you. Over this are divers *Strata* of blueiſh Clay, of which you have alſo a Sample about the height of 20 Foot or more; this Clay hath *Pyrites* or *Copperas* Stones ſticking in it, but no Shells that I could obſerve. Above this are likewiſe divers *Strata*, which reach to within about two Foot of the Surface, ſome of which are only of fine Sand, others ſmall Stones and Gravel mixt with Fragments of Shells, of which I likewiſe ſent you a *Specimen*, and in others ſmall Pebbles are mixt; and it is in ſome of theſe laſt mentioned *Strata*, that the *Foſſil Shells* are imbedded, which lye promiſcuouſly together, I mean the *Bivalve* or *Turbinate*; neither do the *Strata's* with the Shells obſerve any order in their lying, being ſometimes higher and ſometimes lower in the Cliff, and ſometimes two or three one above another with other *Strata's* of Sand, Fragments and Gravel between. Above all theſe is a covering of common Sandy Earth, which is about two Foot thick, in which, in ſome places are Veins of a Species of *Oſteocolla*, though more tender than *Oſteocolla Officinarum*, which is brought from *Germany*: This I have adventured to call *Oſteocolla Anglicana*, it doth incruſt about ſmall Strings like the Fibres of the Roots of Trees, it's of divers Magnitudes, and ſends forth Branches here and there, but is ſo tender, as not to be gotten out of the Earth in any large pieces, Whether like the *German* it appears above the Earth, I never could diſcover.

Before this Cliff, the Shoar, as far as the ebbing of the Sea would permit my Obſervation, was rudely paved with Stones, divers of which are vein'd with that ſort of Body, which by *Helmont* and other later Naturaliſts, is called *Ludus Paracelſi*: Of theſe Stones the Inhabitants have a Tradition that they are form'd by the Clay, which tumbling down from the Cliff, and being waſhed by the flowing of the Sea, are in a ſhort time converted into Stone; and Mr. *Silas Tayler* in his Manuſcript *Collections of Harwich* and *Dovercourt*, (a Copy of which I have) thus writes concerning it. *The waſhing of theſe Cliffs diſcovers a blueiſh Clay, which tumbling down upon the Shoar, although waſhed by the Sea at High-water, within a ſhort time turns into Stone: There may be ſeen ſome that are new fallen as ſoft as the Clay in the Cliff, and others that have lain there longer cruſted over and hard, but if opened or broke, the Clay ſtill ſoft in the middle; others that have lain longeſt petrify'd to the very Heart, and with theſe the* Walls *of the* Town *are for the moſt part built, and the* Streets *generally are pitch'd.* How far this is matter of Fact I will not determine, my Stay at *Harwich* being always too ſhort for me to make Obſervations ſo critical as this doth deſerve; and altho' I muſt at the ſame time own that many of the Stones are waſhed out from the *Stratum* at the bottom of the Cliff, yet I have ſometimes been inclined to Mr. *Tayler*'s Opinion, who ſeems to be a Perſon of Probity and Learning: and alſo becauſe divers of the ſaid Stones have Cracks or Chops in them, as Clay and Earth will have by being expoſed to the Sun; and there is yet [*Anno* 1702.] lying upon that Shoar a Stone, in which a large Pile (perhaps of Oak) ſuch as was formerly made uſe of there to preſerve the Cliff from the Injuries of the Sea, doth evidently appear to be imbedded; which can owe its Situation to no other Original, than by being preſt into the Superficies of the Clay while ſoft, and petrifying with it, which being ſquare, takes off an Objection, which ſome might make had it been round, of its being lodged there in the general Deluge.

I am not inſenſible that this manner of Petrifications is not only different from the common Methods Nature uſeth in that Operation, but alſo thwarts the Opinions of divers learned and ingenious Men, and it was ſtrenuouſly oppos'd by the Reverend Mr. *John Morton* of *Oxendon* in *Northamptonſhire*; who in his Letter, dated *Auguſt* 4, 1699. ſays thus; 'At *Harwich*, under the Cliff, upon the Sea-ſhore, there is a *Stratum* of a *Clayie-ſtone*, which is cover'd here and there with ragged Stones of a cloſer Texture, which was formerly (I conjecture) another entire *Stratum*, but is broken thus by the tearing of the Waves. The *Clayie-ſtone Stratum*, Mr. *Dale* and Mr. *Luffkin* my Companions were of opinion had been formerly a ſofter Subſtance, but was daily petrify'd by the Sea-Water. Having argued a little about it, when turning to the Cliff, I found a *Stratum* there, of the very ſame ſort of *Clayie-ſtone* with that upon the Shore; yet the Sea-water very ſeldom comes up hither, unleſs by Storms and at Spring Tydes. I broke a little piece off, and ſhew'd it to you, and then you was convinc'd (I think) it was not petrify'd by the Sea-Water, but in its natural State. And I have often, I aſſure you, met with juſt ſuch a ſort of Stone in many of our *Stone-Pits* here, in Inland Countries. It appears to me, that the Water ſhould have rather ſoftned than hardned the Stone upon the Shore, tho' by waſhing away the looſer Clayie matter and other earthy Stuff, that is ſometimes left upon it at the Ebb, it might ſeem to be a ſort of *Petrification*; and occaſion this Miſtake. As to *Petrifactions*: I've only obſerv'd theſe three ſorts. *Firſt*, *A Stony Incruſtation* upon Sticks and any thing that lyes in the Way, in the Petrifying Springs; the Earth in thoſe Waters is uſually intermixt with Particles of Stone, that trickle down into it with Water, and are there detain'd. Of this firſt ſort you have doubtleſs many inſtances in *Eſſex*, and I think there is one at *Harwich* Cliff; though this in my Opinion is not ſo properly called a *Petrifaction*. Secondly, The ſecond ſort is that which is perform'd by the *Permeation* or *Inſinuation* of the finer ſorts of Stony *Particles*, as it is in the Caſe of ſome of our Petrifying Waters, (I believe) particularly that at *Knaresborough* ſometimes; the Stony Particles however of the *Knaresborough* Spring are very fine. And many of the *Foſſil-Shells* have undergone the ſame fate. *Thirdly*, The third, which indeed is a *Petrification*, properly ſo called, is often met with on the ſides of *Caves* and *Grotto's*, as at *Pooly-hole* in the *Peak*, and in the *Fiſſures*, and *Clefts* of *Mines* and *Quarries*. Of this kind are the ſeveral ſorts of *Fluors*, the *Lap. Stillatitii*, *Stalagmitæ*, &c. that we meet with in the *Fiſſures*, and *Hiatus*'s of the Earth. Theſe are continually growing (as they vulgarly ſay) that is, are receiving an additional increaſe of real and ſolid Stone, as is obſerved in many *Caves* in the *Peak*, &c. This I take to be perform'd

‘ in ſuch a manner as the *Incruſtations* are, *viz.* the Particles of Stone
‘ are brought along with the Water, as their *Vehicle*, and are depoſited
‘ at length upon the ſides of the *Cave* or *Fiſſure*, (this is matter of
‘ Fact, that there is always a watry Stream, and uſually Water a trickling
‘ down upon the ſides of thoſe *Caves*:) but here, the Particles of
‘ Stone are extreamly minute and fine, and do thereby naturally concert
‘ and joyn together very cloſe; whereas in our *Incruſtations* the
‘ Particles of Stone being groſſer, the Stone is rough, and coarſe, and
‘ friable. And this I leave to your Judgment if it be not a more reaſonable
‘ *Hypotheſis*, than that of Dr. *Plot* in p. 33. of his *Hiſtory of Oxfordſhire*,
‘ viz. *That the very body of the Water is turned into Stone as*
‘ *it drops down from the Rocks.* I know not indeed of any other ſorts of
‘ *Petrification* than theſe I have already mention'd. As to that *Hypotheſis*
‘ of the *Tranſmutaaion* of a *Stratum*, *e. g.* of Chalk to Clay, of Coal to
‘ common Stone, or the like, I muſt confeſs I never met with any thing
‘ in nature which would countenance it, that is, ſuch a *Tranſmutation*
‘ in the Bowels of the Earth. Nor is there any thing that proves it,
‘ that ever I have met with in any *Natural Obſervations*. Only ſome
‘ will gueſs and fancy ſuch a thing, but for making it out, I am ſure I
‘ am no more able to do it, than to make the *Philoſophers Stone*, whatever
‘ they are’.

A late Author is of opinion, That *this Bed of Stones was the Foundation of the Loomy Cliff, where the Cliff has been waſhed away or cut: And that they are the Production of a Vitrioline Juice in Conjunction with the Loam*; as the common Copperas Stones are by the ſame Juice in a *Gravel*, and that the latter were only to be found where the *Cliff was gravelly*, and not *where the Loam is*. How far theſe Stones are the effect of a *Vitrioline Juice*, I will not determine, but this I can affirm, That I have now by me ſome of the *Pyrites* or common *Copperas Stones*, which I did pick out of the *Clayie Stratum* of this Cliff, in which they may be frequently met with, as mentioned in its Deſcription. Nor do I remember at any time to have obſerved theſe *Stones* to be *inveſted with* either *Gypſum* or *Trichitis*, as the ſame Author affirms, but with the aforeſaid *Ludus Paracelſi*, and ſome other ſorts of *Lap. Stalagmitæ* frequently. I ſhall crave Leave to make ſome Remarks on the poſitive Aſſertion of the aforeſaid Author, concerning the imbedding of theſe *Foſſil Shells* in this Cliff, and the Alteration of the Channel, *viz. That this Bed of Shells, which covers the Cliff, was carried thither at the making of the Harbour or clearing of it. For the Harbour or Channel there is artificial and of no old Date, the Current having been formerly on the other ſide of* Languard Ford, *which then ſtood in* Eſſex. Againſt the firſt part of which, although many Reaſons might be given to prove the contrary, I ſhall only trouble you with the following, and as our Author begs the Queſtion, *How elſe could the Shells lye a top* of this Cliff? So I ſhall alſo aſk him, why the ſame Strata of Sand, and Fragments of Shells, with the ſame *Foſſils* imbedded, are to be found at

Walton Neſs on the other ſide of the *Æſtuarium*, which is 5 or 6 Miles broad from *Harwich*, as likewiſe at *Bawdſey* Cliff in *Suffolk*, which is 8 or 9 Miles diſtant, and in other Cliffs on that Shore, where I have met with them. A ſecond Queſtion may here be askt, How it comes to paſs that none of thoſe *Buccina Heteroſtropha*, (whereof ſuch plenty of their *Exuviæ* are in all the Cliffs hereabouts) are not now to be found in this Channel, nor the adjacent Seas? (where I have divers times been a fiſhing) for I cannot think the clearing this Harbour could have deſtroyed all that Species of Shell-Fiſh, whereof there was then ſuch plenty; and therefore ſome other Original muſt be allow'd them, than what this Author has aſſign'd. Nor can I allow the *Harbour* here to be *Artificial*, becauſe ſo great a Work as this is, *viz.* the making a Channel 2 Miles wide, as it is in this place, would not have been without ſome Record thereof in Hiſtory, and beſides, the Earth, *&c.* which muſt ariſe by this Work, muſt conſequently have made a much greater Hill than the Cliff ever was; and another Doubt will from hence ariſe, why the Workmen ſhould bring all the Earth, *&c.* to this ſide the Channel, and not lay ſome thereof on the other, as it's plain they did not. The Ground on which *Landguard Fort* ſtands, as far as *Walton Coleneſs*, which is about three Miles, is only a ſandy Level or Beach, which I believe hath in time ſubſided there, as may be obſerved at the Mouths of other great Rivers. And as to the Argument which our Author brings of *Landguard Fort* being accounted to ſtand in *Eſſex*, to confirm this Hypotheſis of the Change of this Channel; it will be of no force with any one which doth but obſerve, that not only parts of Pariſhes, but likewiſe of Counties, are often divided from thoſe Pariſhes and Counties to which they belong, and included in others, of which I could give you many Inſtances, *e. g.* a part of *Kent* is on the *Eſſex* ſide the *Thames*; and in *Oxfordſhire* the Pariſhes of *Shilton* doth belong to *Berkſhire*, *Daylesford* to *Warwickſhire*, *Compton* to *Glouceſterſhire*, and *Stratton-Audley* to *Buckinghamſhire*, although all included in the other: And there is a Farm which doth belong to the Pariſh of *Braintree*, that is ſeparated from it at leaſt two Miles, and many others might be given, but let theſe ſuffice. And to me a probable Reaſon of this Forts being accounted in *Eſſex*, is; the Sands here ſubſiding made at firſt I ſuppoſe an *Inſula*, which being neareſt to *Eſſex* was accounted of that County; or 2dly, the Iſland ſo made belonging to none but the Crown, it was at the pleaſure of the *King's Officers* to call it of which County they pleaſed. Nor was it the *Gentleman in Cambden's* Ignorance that made him *mention* theſe Stones *for Petrifactions made by the Sea*, for Mr. *Tayler* in his aforeſaid *Collections* did not omit the Tradition the Inhabitants of this Town have about the Alteration of the Mouth of this Haven. *It's generally believed*, ſays he, *That* Stoure *did formerly in a ſtraighter Current (than now it doth) diſcharge it ſelf into the Sea, about* Hoaſley-Bay, *under the Highland of* Walton-Colneſs *and* Felix-Stow *in the County of* Suffolk, *betwixt whom and* Landguard Fort *are (as they are reputed) certain remains of the* *old*

old Channel, which the neighbouring Inhabitants ſtill call Fleets, *retaining at this Day the Tradition of the courſe of the Water, and the entrance into this Haven to have heretofore been by and through them.*

And I am of opinion that this Tradition is matter of Fact, having before hinted to you what Mutations the Mouths of great Rivers daily undergo by the Lodgment of Sands, *&c.* which may be aſſigned as a better reaſon for this Alteration than that of our Author, *i. e.* that it was Artificial; and the yearly waſhing of the Cliff on the *Harwich* ſide, doth likewiſe add to its probability; it being a conſtant Obſervation, that where the Sea gaineth on one ſide, it loſeth on the other. And that this Level was ſo made I am confirm'd by the modern removal of the Fort, more towards the Point, more Sands, I conjecture, being added after the old Fort was built. The Spring mentioned by Mr. *Edmund* † *Gibſon*, in his *Engliſh* Edition of *Cambden*, from the aforeſaid Manuſcript of Mr. *Silas Tayler*, is a very ſmall inconſiderable thing; nor could I obſerve that it did petrifie or incruſtate either pieces of Wood or Sticks, but I have a piece, which I broke off from a large Pile upon that Shoar, which was petrified ſo far as it was droven into the Earth, and the Sea Water came; and do ſuſpect there yet remains ſome others of the ſame. And of this ſort I believe, is that large piece ſent from hence, which Mr. *Tayler* mentions to be *reſerved in the Repoſitory of the Royal Society.*

† *Now Lord Biſhop of* Lincoln.

I have already taken notice, that the *Foſſil Shells* are imbedded in a looſe *Stratum* of Sand, Gravel, *&c.* which may ſerve to demonſtrate that their *Matrix* is not a *Clay Bed upon the top* of the Cliff; as likewiſe for another Argument to evince that they could not be there ſcattered by *Crows*, *Gulls*, and other Sea Fowls, as well as that ſome of them are likewiſe bedded in Stone at the bottom of the Cliff; and although ſome few of them may be met with upon the top of the Cliff, yet it's only where the Earth has been broken by digging of Ditches, *&c.*

River and other Shells found under Ground, by Dr. Morton, *n.* 305. *p.* 2210.

XV. Cauſing one to dig into the mooriſh Ground in *Mears Aſhby* Field in *Northamptonſhire*; we found a ſmall number of Snail Shells of various kinds buryed there. At about a Foot in depth they lay very thick; and ſinking ſtill downwards, the number rather encreaſed till we came to the depth of about three Foot. 'Twas troubleſome to ſink deeper on purpoſe; but we made Tryals for a conſiderable extent of Ground, *viz.* about 250 Foot in length, and 130 in breadth. Beſides, the ſame Shells were caſt up in ſeveral places, at diſtance, by Moles. What we principally obſerved in this ſearch was 1. A moiſt Mooriſh black Earth, in ſome places a Foot and a half, in others ſomewhat above two Foot in thickneſs. The lower half of it is blacker and denſer than the upper half, of a Bituminous Nature, and has all the Characters of Peat-Earth. Beſides Shells we found Stalks and Leaves of Graſs, and alſo of many Kinds of other Vegetables repoſited as uſual in like Bituminous Moors, in other parts of this Iſland. 2. White Earth; ſo at firſt we call'd it: But upon cloſer Inſpection it appeared to be little more than Hay half waſted. So deep as we ſunk into it, we found it every where copiouſly interſpers'd with Shells. I diligently ſearch'd this place, but cou'd not meet with any live ones of any kind whatever on the Surface.

The Foſſil Shells were ſome the *Exuviæ* of Land-Snails, the reſt of River or freſh Water-Snails: Of the former there were the three following kinds. 1. A ſmall *Buccinum* of five Wreaths, the *Buccinum exiguum quinque anfractuum, Tit.* 7. *Liſt. in Tractat. de Cochleis Terreſtr. Angl.* A kind obſerv'd by Dr. *Liſter* to live in Moſs upon old Garden Walls at *Eſtrope* in *Lincolnſhire*; by my ſelf, at the Moſſy Roots of old Trees in many of the *Northamptonſhire* Woods, as alſo amongſt Moſs upon the Boggy ſides of ſeveral ſtanding Springs. 2. A *Cochlea* of the compreſſed kind, but not ſo much compreſſed as ſome of them are. It has five Wreaths and a ſmall circular *Sinus* in the Center. This, if it is not the *Cochlea umbilicata, &c. N.* 79. *Liſt. Hiſt. Conchyl. Lib.* I. has not hitherto been mention'd by any Writer; tho' common enough in the Woods in *Northamptonſhire*: I found a greater number of them, for the Compaſs of Ground incloſ'd in the Earth, than ever I have done in any of the Places where they naturally breed. 3. The *Cochlea citrina Tit.* 3. *Liſt. de Cochl. Terreſt. Ang.* The common ſtrip'd Snail-Shell. But moſt of theſe in the Moor are white, of the colour of the Shells that have been a long time dead. In ſome I ſaw faint Footſteps of their former Stripes. Moſt of the Shells of this kind were lodg'd about 4 Foot deep.

We met with only two different kinds of River-Shells. 1. A Perewinkle Shell of three Wreaths, generally leſs than the *Buccinum trium Spirar. Tit.* 24. *Liſt. de Cochleis Fluviatil. Ang.* There were a greater Number of theſe buried in the Moor than of any of the former kinds. 2. A Perewinkle Shell of five Wreaths, much ſmaller and more prominent than thoſe of the *Buccinum longum ſex Spirarum Tit.* 21. *Liſt. de Coch. Fluviat.* 'Tis otherwiſe very like that *Buccinum* in the Faſhion of its Wreaths. It has not yet been deſcrib'd by any Author. We find the kind now living in one of the *Northamptonſhire* Brooks call'd the *Iſe*.

The Mooriſh Ground wherein theſe Shells were buryed extends from near the top to very near the Foot of a ſmall Hill. Above the Moor, upon the top, and at the Brow of the Hill, is a ſandy Soil of a reddiſh Colour. The whole Face of the Moor is plain and even, conformable to the reſt of the Hill not thus moory of the ſame Declination with it, and appears to be in a natural and undiſturb'd State, as much ſo as any of the Slades in the neighbouring Fields; except that three or four Trenches have been cut through it of late. 'Tis evident theſe Shells were left at the Deluge, when thoſe from Sea were alſo repoſited at Land; and not buried ſince by Deterrations from the Ground above. For then the uppermoſt parts of the Moor muſt have been cover'd with a reddiſh Sand; ſuch as the Ground is for the Main compoſ'd of; but nothing like that appears in the Shells of this Moor. Beſides here are

dug up Shells that in all likelihood never bred there, but are Inhabitants of a different Soil: particularly the ſtrip'd Snail Shell; for theſe Animals have peculiar Soils, and affect particular Regions.

Of Amber, *by Fr.* Camelli, *n.*290. *p.*1591

XVI. Quis opinioni, *Ambari* originem ab arboribus deducentium, utpote veriſimili ac valde probabili non ſubſcribit? More fungorum etenim generari valde dubium eſt. Algas, aut maris recrementitiam putrilaginem materiam eſſe poſſe *Ambari*, non facile crediderim. Herbas aut arbores reſiniferas in ipſo mari enaſci necdum conſtat. Bituminis, aut terræ genus eſſe, non eſt veriſimile. Fictitium eſſe, falſum eſt. Avium ſtercus, Elephantis ſemen, Balænæ, aut alterius Piſcis eſſe liquorem, hepar, ſperma, aut excrementum, fabuloſum videtur. A *Balænis* nihilominus, aut aliis Cetaceis, aliquando Ambarum tanquam nutritioni prorſus ineptum evomi, (quod & *Odoardus Barboſa* annotat) in earumve œſophago, aut ventriculo nonnunquam ut indigeſtibile inveniri lubens conceſſerim, ſiquidem hujuſcemodi monſtrua oblatas offas, nequaquam ut pueri poma diligere, aut prælibare ſolent, ſed quicquid faucium eorum hiatui influxerit ingurgitant. † Reſinoſum itaque ſalvo aliorum judicio liquorem, quem *Indi* variarum provinciarum *Agacabac* l. *Hagac bac. Bintogo* l. *Bintoco Apitono* & *Malibabo. Cayancang.* & *Bolotic* alii vocant, quemve unum eundemve cum ea ſicca, & indurata reſina, quæ mihi de montibus *Ilocos*, & *Paynan* in magnis allata fuit fragmentis eſſe judico: *Ambari* legitimam materiam eſſe ſuſpicor. Verum tempeſtuoſa oborta procella, & pluviarum continuatione, univerſali facta inundatione a mediterraneis latebris, ac & ſpineta inacceſſibilium montium jugis, torrentium impetuoſo, ac verſabundo curſu præcipitanter in mare delatum, ibidemque a decumana fluctuum exagitatione, & concuſſione æſtuante marina aqua nonnihil emollitum ac elotum, beneficio particularum Salis marini, nec non Solis demum accedentibus ardentiſſimis radiis, ita immutatum, elaboratum ac præparatum, ut tandem placato turbine ad littus refluis propulſus fluctibus a reſina recenter ex arbore collecta, aut etiam tractu temporis in montanis deſiccata, diſtinctiſſimam violento nempe hocce beneficio acquiſitam præ ſe ferat formam †, eamve prouti ſcilicet, pluſve minuſve temporis aqua marina maceratus, fluctuum concuſſione elotus, ac Solis excoctus ſeu dealbatus fuerit ardore, magis aut minus candidam. Verum communiter non niſi poſtquam Pluviarum continuatione mediterranea inundentur, & terribilium ventorum furia exagitatum fuerit mare, horrenda fluctuum concuſſione abyſſos ipſos, & ſinuum ac concavitatum latebras everrendo ſordes tanti ponderis in littus rejiciuntur. Hujus conjecturæ certum, & evidens præbent Argumentum Anno 1694. Januario *Manilam* allata *Ambari* fruſta grandiora, ſolida, pura & heterogeneis carentia, in littore circa *Palagpag* collecta. (Nota, poſt ſub finem Februarii 1693. horribilem exortam turbinem) erant autem *partim* coloris opacioris *ſuccini flavi*, ſeu facie gummi *Arabicæ*: vitro criſtallino vix non pellucidiori de *Ilocos* miſſæ reſinæ magis in luteum vergentia: Reſinæ vero de *Paynan* allatæ propemodum ſimilia, ſed

minus

† *Ipſum l. conſimilem.*

† Barboſa *ae is Soli, & Lunæ continuo expoſitum reſinare tradit.*

minus odora, uſta videlicet, igne ut hæc & altera facile liqueſcentia, & lapideæ ferme duritiei, ita ut nec culter nec dentes ſignum imprimerent. *Partim* ſeu latere uno ex candido griſea, varie fiſſa, friabilia quidem, ſed omni hucuſque a me viſo *Ambaro* ſolidiora. Pro *Ambaro* autem omnium optimo genuino, & legitimo divendita fuerunt. Huic meæ opinioni non invitus objecerat adverſarius, non poſſe eſſe *Ambarum* hujuſcemodi arborum reſinam, eo quod fruſta maxima reperta fuerint; cui reſpondebam fieri poſſe, ut varii hujus reſinæ glumi obvios inter fluctuum recurſus, aut etiam torrentium decurſus, utpote homogenei, & tenaces ſocientur, ſibi cohæreant, agglutinentur, & in fruſta majora denique abeant, ac conglomerentur. Et quidni magna poſſibile eſt reperiri hujuſcemodi reſinæ fruſta, cum hujates montes arbores reſiniferas incredibilis alant vertitatis, & ad *Pilis* & *Lauvan* caudices ſæpius centenarii colligantur reſinæ, & fragmenta de *Ilocos* ac *Paynan* allatæ reſinæ ſane maximum fuiſſe glomum, unde deſumpta fuerant, teſtentur. *Fran. Combes* † refert in littore *Iolo* (*Batavis* Inſula *Margarifera*) fuiſſe repertum fruſtum *Ambari*, bovini corporis trunco majus, ſed reſinæ ordinariæ loco vix non fuiſſe conſumptum. *Idem* referre videtur *Fran. Colin* † ſcribens circa *Inſulam Iolo*, fruſtum *Ambari*, griſei, & optimi inventum fuiſſe ultra ducentas libras pendens. Et idem *Ignatius Alzina* in *Hiſt. Byſaiarum* recenſere puto, qui dicit in *Iolo* fruſtum fuiſſe collectum corpore humano craſſius, & duplo longius vilique ob copiam diſtractum fuiſſe pretio. An. 1632. ad promontorium *Sancti Spiritus* in Coſta de *Igbabao* ambari fragmentum 55 circiter librarum inventum fuit, cujus uncia 30 Imp. quia ſane optimum fuit, divenditum eſt. *Indus* ſiquidem, cui ſors obtigerat, tres impleverat corbes, quorum duos ob cognitionis, & exinde eſtimationis defectuum, domus ſuæ illuminandi gratia, reſinæ loco inſumpſerat. (his uſibus antiquitus, plerumque *Byſaianis*, Ambarum a reſina non diſtinguendo deſerviebat.) idem facturus cum corbe tertio, niſi hoſpes magis verſatus ex odoris fragrantia, fumi recta aſcendentis diſtinctivo, non reſinam vulgarem, ſed nobiliſſimam, ſeu *Ambarum* eſſe prodidiſſet. *Caſpar Bayam* circa 1680. inter *Aden* & *Meccam* in alto mari Ambari truncum prægrandem obvium habuit. In *Bangabun* vetula conchylia legens, fruſtum magnitudinis brachii invenit, pro reſina odorifera ordinaria habuit, (nam variæ & multæ reſinæ odoriferæ ſpecies a mari in littus propelluntur, ut *Bateto*, Ambarum redolens, quam *Ambarum* quod vocant nigrum eſſe cenſeo; eo quod curatum, non ſemel pro viliori divendatur *Ambaro*. *Dairiangao*, *Raporago*, *Benzoini redolent*. *Tangay Samato*. Aliis *Samata*, liquidambram, aut balſamum ſpirantes.) ſuffumigiis deſtinavit, & ferme in totum antequam quid rei eſſet edocta fuiſſet, conſumſit. *Ambarum* non raro valde tenax, & picis liquidæ modo molle inveniri multi affirmant, quod & *Fran. Combes* inſinuat dum ſcribit, aliquando in littore liquorem mollem, & recentem colligi, qui aſſervatus, nec non beneficiatus optimum eſſe deprehenditur *Ambarum*. Communis autem & vulgaris eſt opinio, quod & *Hieronymus de Huerta* cum *Fran. Combes* affirmat, *Ambarum* crudum aut recenter collectum, fragranti carere odore: *Joh.*

nihilo-

† *Hiſt. Inſ. Mindanai f.* 15.

† *Hiſt. Philippin. f.* 49.

† F 90.

* *In Hiſt. Chilenſi.*

Act. Med. Philoſ. Haf. An. 1671 *Obſ.* 57. *f.* 113.

nihilominus *Botera Benes*, † *Ambarum* in *Ava* proſtans, & non adulteratum odoris eſſe ſumme fragrantis, ac acuti, ut naribus admotum illico ſanguinem profluere faciat. *Alphonſus* de *Ovalle* * ſcribit, *Griſeum* eſſe odoris ſuavis, *nigrum* acutioris, differentiam vero hanc odoris & coloris inde provenire, quod nigrum griſeo breviori tempore in mari, ac Soli expoſitum fuerit. *Sennertus* de Bitumine, *Ambram* odoratam, Bitumen eſſe ex amaris fontibus manans, & in ſummo mari, aeri expoſitum denſari & coagulari, ut ſuccinum, cenſet. Dealbationem itaque *Ambari*, & duritiem, ac denſitatem ſali, ſaliniſque maris particulis, prouti *Succini* Soliditatem *Thomas Bartholinus*, adſcribemus. *Ambræ griſeæ* valde candicantis, & ut vocant firmiſſimæ, aſſervo partem varie exciſam & atterebratam quinis conchyliis, & particula ligni putridi inhærente. Certum argumentum bonitatis gradum a diuturnitate elotionis, & mora in maritimis, fuiſſe aſſecutam.

Of Cobalt, and the Preparation of Smalt and Arſenick, by ***Dr.*** **Krieg,** *n.* 293. *p.* 1753.

XVII. The *Cadmia* or *Cobalt* is a maſſy, grey, ſhining Stone, found in a great Quantity in the Mines about *Shneeberg*, and ſome other places of *Hermanduria*. 'Tis very often mixt with Marchaſite, ſometimes with Silver and Copper Ore; yea, the Silver is, but ſeldom, pure in the Figure of Hair. After they have pick'd out the Cobalt, and ſeparated it from the common Stone, they beat it to Powder, by an Engine commonly us'd in Mines, call'd a Pool-Work. By that Operation, the Water carries away the light Stuff and Sand, leaving the heavieſt behind. This Powder is afterwards put into a low and broad Furnace, made on purpoſe to ſeparate the Sulphur and Arſenick; where the Powder is ſpread all over, and the Fire, which is beneath and behind it, is forced to paſs its Flame along over the Powder, and ſo to take along with it the Arſenick in form of a Smoak, which afterwards is receiv'd by a low Chimney, and out of that carried in a cloſe Channel made of Brick-Wall, of about 50 or more Paces, where the Arſenick by the way ſticks to the Wall, in form of a white or yellowiſh Powder. The ſame is taken out every 6 Months and melted into whole pieces.

The *Cobalt* thus roaſted, and ſmoaking little more, being red hot, is taken out, cooled again and gathered for melting. Its *Colour* by that way of roaſting is turned a little more whitiſh. When they have a mind to melt it, the Powder of the *Cobalt* is mixed with Pot Aſhes and Powder of white Flint Stones: The Proportion of them is according to the Goodneſs of the *Cobalt*, or as they will make the *Smalt* of a deep or paler colour: For Example, they take one part of Pot Aſhes, two parts of *Cobalt*, and three or four parts of Flint. This Mixture is put into great ſtrong Pots, ſtanding in a hot Furnace; ſix or eight Pots in one Furnace; there it ſtands a melting for five or ſix hours time, turning into a blue Glaſs, which afterwards is taken out with a great Iron Spoon and put into a Veſſel full of cold Water, where it cracketh and grows more tender, to be the more eaſily powdered again: But the empty

Fig. 3.

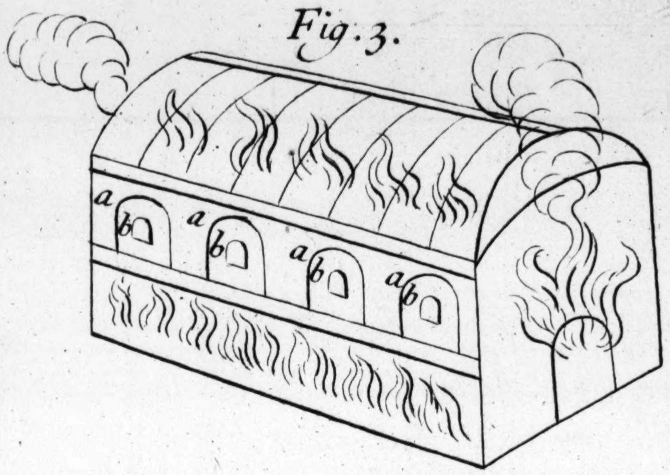


Fig. 4.

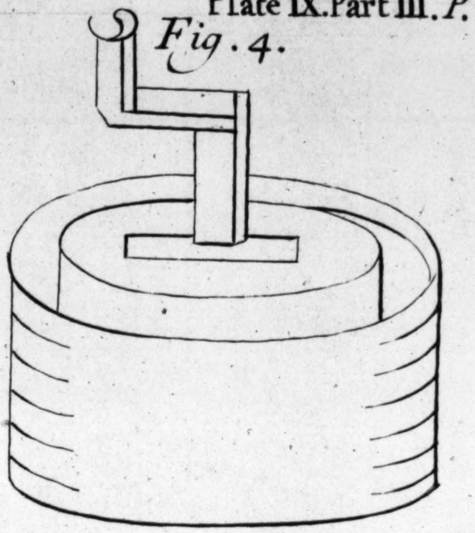


Fig. 1.

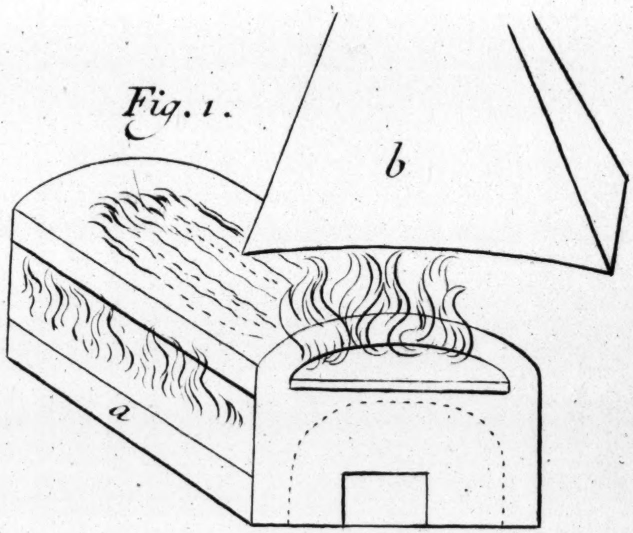
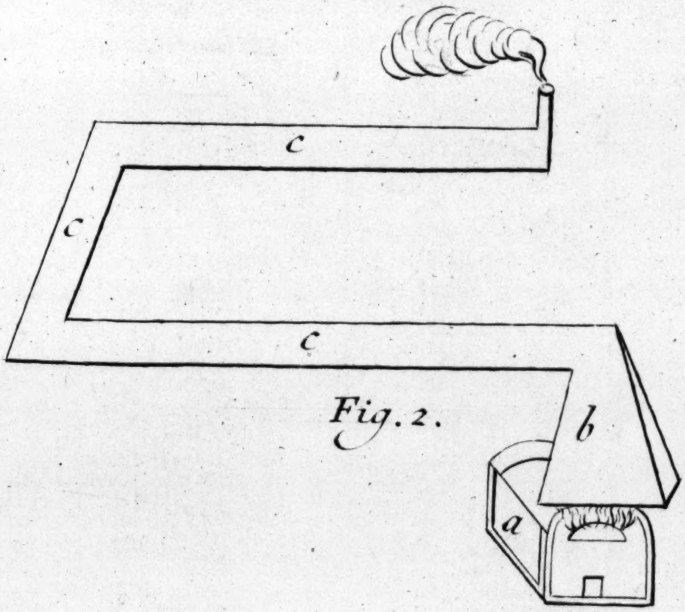


Fig. 2.



Pot in the Furnace is filled up again with the aforeſaid mixture. And ſo they continue Night and Day, not leaving off the Fire in the Furnace.

The blue Glaſs taken out of the Water is powdered again by the ordinary Engine; the fineſt, ſeparated by a Sieve, is put into a Mill, and grinded in Water into the fineſt Powder, which by waſhing is ſtill ſeparated from the Coarſer. It is afterwards dryed in little and warm Chambers, put into Barrels, and thus ſent away to ſeveral Countries. If one of the Melting Pots breaks, or is very much burnt, ſo that it muſt be taken out, there they find always on the bottom two Cakes of different Stuff, not mixed with one another. The undermoſt is a ſort of *æs Caldarium* or *(Gleiken Spiſſe)* and the uppermoſt is of *Marcaſit.* The Graſs and Fruits growing thereabout, where ſuch a Work-houſe ſtands, is commonly poiſoned by the Arſenical Smoak, that no Cattle or Men can without Damage feed upon them.

Explication of the Figures, Plate 9.

Fig. 1, 2. The Furnace where the Cobalt is roaſted, and the Arſenick ſeparated. *a* The Furnace to roaſt the powder'd Cobalt. *b* The Chimney accepting the Arſenical Smoak. *c. c. c.* The Channel of Stones to collect the Arſenick.

Fig. 3. The Furnace for melting the Cobalt into a Glaſs, *a a a a* the holes where ſtand the Melting Pots. The great holes, where they *b b b b* put in the Pots is ſhut up with Bricks, and a little one left; where they take out the Glaſs with the Spoon.

Fig. 4. Two Grinding Stones to grind in Water.

Subterraneous Trees in Hatfield Chace, by Mr. Dela Pryme, *n.* 275. *p.* 980.

XVIII. The Levels of *Hatfield* Chace, being above 180,000 Acres of Land, were about half of them yearly drown'd and hurtfully ſurrounded with an Ocean of Waters. *King* Charles I. Bargains, and ſells to Sir *Cornelius Vermuyden*, a *Dutchman*, to diſchace, drain and reduce them to conſtant Arable and Paſture Ground, which to the Surprize of the whole Nation, and at the Charge of above 400,000 *l.* he at length happily effected.

In the Soil of all, or moſt of which the abovesaid 180000 Acres of Land, of which 90000 were drained, even in the bottom of the River of *Ouſe*, in the bottom of the adventitious Soil of all *Marſhland*, and round about by the Skirts of the *Lincolnſhire* Woulds unto *Gainsburg*, *Bantry*, *Doncaſter*, *Baln*, *Snaith* and *Holden*, are found infinite Millions of the Roots and Bodies of Trees of all bigneſſes great and little, and of moſt of the ſorts this Iſland either formerly did, or at preſent does produce, as Pitch Trees commonly called Firrs, Oaks, Birch, Beech, Yew, Wirethorn, Willow, Aſh, *&c.* the Roots of all, or moſt of which ſtand in the Soil in their natural Poſtures, as thick as ever they could grow, as the Bodies of moſt of them lye by their proper Roots. Moſt of the great Trees, lie all their length about a Yard from their great Roots (unto which they did moſt evidently belong, both by their Situation, and the Sameneſs of the Wood) with their tops commonly North Eaſt, though indeed the ſmaller Trees lye almoſt every way croſs thoſe, ſome above, ſome under, a third part of all which are Pitch Trees, commonly called Firrs, ſome of which have been found of thirty Yards length and above, and have been ſold to make Maſts and Keels for Ships. Oaks have been found of 20, 30 and 35 Yards long, yet wanting many Yards at the ſmall end. Some of which have been ſold for 4, 8, 10 and 15 *l.* a piece. Which are as black as Ebony, and very laſting and durable in any Service that they are put unto. As for Aſhes, it is commonly obſerved of them, that their Conſtituent parts and Texture are ſo diſſolv'd, that they become as ſoft as Earth, and are commonly cut in pieces by the Workmens Spades, which as ſoon as flung up into the open Air, fall away into Duſt; but all the reſt, even the Willows themſelves, which are ſofter than Aſhes, preſerve their Subſtance and Texture to this Day. I have ſeen ſome Pitch or Firr Trees, that as they have laid all along, after that they were fallen, have ſtruck up great Branches from their Sides, which have grown unto the Thickneſs and Height of conſiderable Trees.

It is very obſervable, and manifeſtly evident, that many of thoſe Trees of all ſorts have been burnt, but eſpecially the Pitch or Firr Trees, ſome quite through, and ſome all on a ſide; ſome have been found chopp'd and ſquared, ſome bored through, other ſome half riven with great wooden Wedges and Stones in them, and broken Ax-heads, ſomewhat like ſacrificing Axes in ſhape, and all this in ſuch places, and at ſuch depths as could never be opened from the Deſtruction of this Foreſt, until the time of the Drainage. Near a great Root in the Pariſh of *Hatfield*, were found 8 or 9 Coins of ſome of the *Roman* Emperors, but exceedingly conſumed and defaced with Time: and it is very obſervable, that upon the Confines of this low Country between *Burningham* and *Brumby* in *Lincolnſhire*, are ſeveral great Hills of looſe Sand, which as they are yearly worn and blown away with the Sand, are diſcovered under them many Roots of great Firrs or Pitch Trees, with the Impreſſes of the Ax as freſh upon them, as if they had but been cut down a few Weeks, which I have ſeveral times with pleaſure taken notice of, as I have rid that way. Hazle Nuts and Acorns have frequently been found at the bottom of the Soil of thoſe Levels and Mores, and Firr or Pitch, Tree Apples or Cones in great quantities by whole Buſhels together. And at the very bottom of a new River or Drain, that the Drainers cut (almoſt 100 Yards wide, and 4 or 5 Miles long, at the Charge of above 30000 *l.* beſides the great Sluice at the end thereof, which coſt near 30000 *l.* more) were found old Trees ſquared and cut, Rails, Stoups, Bars, old Links of Chains, Horſe-heads, an old Ax ſomewhat like a Battle Ax, two or three Coins of the Emperor *Veſpatian*, one of which I have ſeen in the Hands of Mr. *Cornelius Lee* of *Hatfield*, with the Emperor's Head on the one ſide, and a Spread-Eagle on the other, but that which is more obſervable is, That the very ground at the bottom of the River was found in ſome Places to lye in Rigg and Fur, manifeſting thereby that it had been plow'd and tilled in former Days.

A Friend told me, That about 50 Years ago, under a great Tree in this Pariſh was found an old ſhaped Knife, with a Haft of a very hard black ſort of Wood, which had a Cap of Copper or Braſs on the one end, and a Hoop of the ſame Metal on the other end, where the Blade went into it. He alſo found an Oak Tree within his Mores 40 Yards long, 4 Yards diametrically thick at the great end, 3 Yards and a Foot in the middle, and two Yards over at the ſmall end, ſo that by moderate Computation, the Tree ſeems to have been as long again, for which he had 20 *l.* proffered. At another time he found a Pitch or Firr-Tree 36 Yards long, beſides the computed length thereof, which might well be 15 Yards more. So that there hath been exceeding great Trees in theſe Levels; that which is alſo very ſtrange, is that about 50 Years ago, at the very bottom of a Turf-Pit, was found a Man lying at his length, with his Head upon his Arm, as in a common poſture of ſleep, whoſe Skin, being as it were tann'd by the More Water, preſerved his ſhape intire, but within, his Fleſh and moſt of his Bones were conſumed and gone, an Arm of whom one of the Workmen cut off, and brought home. The like hath been obſerved in other Places and Countries, upon this very Subject of Subterraneous Trees.

Seeing we find Roots and Trees, with other things that are common to theſe Levels, not only there, but alſo in other * Countries, the thing that yet remains to be enquired into is, How all this comes to be thus, and what Reaſons and Cauſes can be given for the ſame. I conceive, that all thoſe Trees grew in the very places where we now find them, both in this Country and all others where they are found. I never heard any Objections but two, of any note made againſt my ſaid Opinion herein.

* *See* Cambden's Britannia. Plot's Staffordſhire, Leigh's Cheſhire, & *al.*

The firſt always was, That *Cæſar* expreſly ſays that no Firr-Trees in his time grew in *Britain.* This I do acknowledge to be true, and is ſo far from proving what it is brought for, that it is nothing at all to the purpoſe. For thoſe Trees that are called Firs by the Vulgar (from their near Conformity and Likeneſs to that Tree) are well known by all learned Men (by the Redneſs, the roſinous nature of the Wood, the Gracil Cones hanging downwards, *&c.*) to be the true Pitch-Tree, of which there are ſuch great plenty in *Norway*, *Sweden*, and other Countries of the North, of which there are whole Woods of them at this very preſent in *Scotland*, and upon a Hill at *Wareton* in *Staffordſhire* they grow wild to this very Day. In an old Deed relating to this very Chace, Fir-Trees or Buſhes are mentioned as growing here and there one, about 300 Years ago; and it is very well known, that there was a Tree of the very ſame Wood growing upon *Hatfield* More ſide within this 30 Years, which a while after was cut down to make a Rail of, it being the very laſt of that kind that was ſeen flouriſhing here. The ſecond was, That thoſe ſorts of Trees are ſo wedded to the high Mountains and Rocks, that they never thrive, nor naturally grow upon ſuch low Grounds and Moraſſes, as theſe are where we now find them bury'd. But this I may be bold to ſay is a great Miſtake, for though they do indeed in all cold Countries of the North thrive beſt there upon the hardeſt Rocks and Mountains, yet are they ſometimes ſeen even there plentiful and great, in the low Moraſſes of *Lieſland*, *Courland*, *Pomerania*, and other Countries thereabouts; and in the low Foreſts and Woods Weſt of *New England*, as I have heard many Travellers affirm; for the Truth is, That which theſe ſtately Trees chiefly delight to grow in, is a ſandy Soil; and if it lie never ſo high, or never ſo low, there they will grow, and there it is natural to them. And as the Reverend and ingenious Mr. *Earat* Miniſter of *Hatfield*, lately obſerved in the digging of the Pit of a great Decoy in theſe Levels, the Roots of the Firs or Pitch-Trees always ſtood in the Sand, and the Oaks in the Clay; and I have obſerved the ſame in Multitudes of places of theſe Commons. So that the Soil is not at all unnatural to them, as ſome have fooliſhly imagin'd; and that they did all grow here there is no doubt to be made.

Thus as all thoſe great and ſtately Trees flouriſh'd here, and compoſed one of the largeſt and moſt beautiful Foreſts in all the Country; ſo in the next place, I ſhall enquire how it came to be deſtroy'd, and for what Reaſons and Cauſes it was ſo. All this may be known by ſearching into the ancient *Roman* Writers and Hiſtorians: who frequently tell us, that when their Armies and Generals purſued the wild *Britains*, that they always fled into the Faſtneſſes of Miry Woods and low watry Foreſts. *Cæſar* himſelf confeſſes the ſame, and ſays, That *Caſſibelan* and his *Britains* after their Defeat paſſed the *Thames*, and fled into ſuch low Moraſſes and Woods, that there was no Poſſibility of following them. We find alſo that the ſtout Nation of the *Silures* did the ſame when they were ſet upon by *Oſtorius* and *Agricola*. The like did *Venutius* King of the *Brigantes*, who fled into the great woody Moraſſes of this Country, and perhaps into thoſe very ſame that formerly overſpread theſe Levels. And *Herodian* plainly tells us, That it was the Cuſtom of the wild *Britains* to keep in the Fenny Bogs and thick marſhy Woods, and when Opportunity offer'd to iſſue out and fall upon the *Romans*, who were at length ſo plagued with them, that they were forced to iſſue out Orders for the deſtroying and cutting down of all the Woods and Foreſts in *Britain*, eſpecially of all thoſe that grew upon Low Grounds and Moraſſes. That they were accordingly thereupon cut down, is evident in many Writers, who tell us, That when *Suetonius Paulinus* conquer'd *Angleſea*, he cut down all the Woods there. *Galen* the Phyſician tells us, That the *Romans* kept their Soldiers continually employed in cutting down of Woods, draining of Marſhes and Fenns, and in Paving of Bogs. It is manifeſt alſo, that they did not only do this themſelves, but alſo impoſed the ſame heavy Task upon the Captive *Britains*, for *Galgacus* in his Speech to his Soldiers tells them, That the *Romans* made Slaves of them, and wore out their Bodies in cutting down of Woods and in cleanſing of Bogs, amidſt a thouſand Stripes and Indignities: But that which is moſt obſervable, is what *Dion Caſſius* tells us, to wit, That the Emperor *Severus* loſt 50000 of his Men in a few Years time, in cutting down of the Woods, and cleanſing of the Fenns and Moraſſes of the Nation. Now all that hath been alledged may I think ſufficiently prove, That the *Romans* were the Deſtroyers of all thoſe great Woods and Forreſts, that we now find under ground in the bottoms of Mores and Bogs, and that they actually were in this part of the Country, and deſtroyed this great and beautiful one, of ſtately Firs or Pitch Trees, that overſpread all thoſe vaſt Levels, and the Country round about.

I come now more particularly to ſhew and prove, the common Road of the *Romans* out of the *South* into the *North*, was formerly from *Lindum* (*Lincoln*) to *Segelocum* [*Little burrow* upon *Trent*] and from thence to *Danum* [*Doncaſter*, where they kept a ſtanding Garriſon of *Criſpinian* Horſe] a little off on the Eaſt and North Eaſt of their Road between the two laſt named Towns lay the Borders of the great Foreſt which ſwarmed with wild *Britains*, who were continually making their Sallies out of the ſame, and their Retreats into it again, intercepting their Proviſions, taking and deſtroying their Carriages, killing their Allies and Paſſengers, and diſturbing their Garriſons; which at length ſo enraged the *Romans*, that they were reſolved to deſtroy it; and that they might do the ſame more effectually, as well as the more eaſily, they marched with a great Army againſt the ſame, and encamped upon a great Heath or More, not far from *Finningly*, (as by their Fortifications there yet to be ſeen is apparent) where it is probable that a great Battle enſued, for hard by is a little Town called *Oſterfield*. Now as the latter part of the Word is never uſed to be added to any other, but where there hath been a Battle; ſo the former ſeems to tell us what *Roman* General it was that fought, to wit, the famous *Oſtorius*, who, all the *Roman* Hiſtorians aſſure us, was in theſe Parts. But who got the Victory is not ſo eaſy to be judged of, though no doubt it was the valiant *Romans*, who, beſides the Multitudes of the *Britains* that they ſlew, drove the reſt back into the great Foreſt and Wood, that covered all this low Country. Whereupon the *Romans*, that they might both deſtroy it and the Enemy the eaſier, took the Opportunity of a ſtrong South Weſt Wind, and ſet great Fires therein, which taking hold of the Fir-Trees, burnt like Pitch, and conſumed infinite numbers of them; then when the Fire had done what Miſchief and Execution it could, the *Romans* brought their Army nearer, and with whole Legions of Captive *Britains* chopp'd and cut down moſt of the Trees, that were yet left ſtanding, leaving only here and there ſome great ones untouched, as Monuments of their Fury, and un-needful of their Labour; which being deſtitute of the ſupport of the Under-wood, and of their neighbouring Trees, were eaſily overturned by ſtrong Winds. All which Trees falling croſs the Rivers that formerly ran through this low Country, ſoon damm'd up the ſame, turned it into a great Lake, and gave Origin to the great Turf Mores that are here, by the Girations and Workings of the Waters, the Precipitation therefrom of terreſtrial Matter, the Conſumption and Putrifaction of rotten Boughs and Branches, and the vaſt increaſe of thick Water Moſs, which wonderfully flouriſhes, and grows upon rotten Grounds. Which even now ſince the Drainage, and ſince that the Country is laid dry for many Miles round about, yet for all that, are ſo turgid with Water, and ſo ſoft and rotten, that they will ſcarce bear Men to walk upon.

Hence it is, that old *Roman* Coins, old *Roman* Ax-heads, *&c.* have been found by thoſe Roots and Trees that lie at the bottom of theſe Mores and Levels. That in all theſe Grounds are found great numbers of Trees that are burnt, ſome in two, and ſome length ways, others hewn and chopp'd. That they lie by their own proper Roots with their tops North Eaſt. That ſome of the greateſt Trees are found with their Roots on, and others as they have laid all along have had Branches growing out of their Sides, unto the Thickneſs and Height of conſiderable Trees: And that both the Clay and More Soil of the Country is in ſome Places two or three Yards higher than it was formerly, by the growing up of the ſame, and the daily Warp that the Rivers continually caſt thereon, *&c.*

But to return, as the *Romans* were the Deſtroyers of this great Foreſt, ſo were they likewiſe of all thoſe others that formerly grew upon the Low Countries of *Cheſhire*, *Lancaſhire*, *Yorkſhire*, *Lincolnſhire*, *Staffordſhire*, *Somerſetſhire*, *&c.* Yea, and of the very Countries which were beyond Sea, where ſuch like Trees are commonly found. But as the *Romans* were not much in *Wales*, the *Iſle of Man*, nor *Ireland*, ſo it cannot be ſuppoſed that it ſhould be they that cut down their Woods; but tho' that they did not, yet others did, for *Hollinſhead* and others of our Hiſtorians tell us, That *Edward* the Firſt being not able to get near the *Welſh* to fight them, by their Continuance and Skulking in boggy Woods, commanded them all to be deſtroy'd and cut down by the Fire and Ax: and I doubt not at all but that the Roots and Trees mentioned by *Cambrenſis* in *Pembrokeſhire*, were the Relicts of ſome of thoſe that were then deſtroy'd: And as for thoſe in *Man* and other Iſlands, they have all been cut down in the time of War, and have laid till they were grown over with the Soil of the neighbouring Grounds: And as for thoſe that are found in the Bogs of *Ireland*, many of our Hiſtorians expreſsly ſay, That *Henry* the Second, when he conquer'd it, cut down all the Woods that grew upon the Low Countries thereof, the better to ſecure his Conqueſt and Poſſeſſion of the ſame, to keep the Country in a ſettled Peace, and to diſarm the Enemy, who commonly truſting to ſuch Advantages, are apt to Rebel; for ſafe Retreats are commonly obſerved to make not more Thieves than they do Rebels. I will only add, That it is a very common thing for Generals and Armies to this Day to deſtroy all the Woods that grow upon advantageous Places and Faſtneſſes in an Enemies Country, if they intend to keep the ſame; and that they always do it with the Fire and Ax.

ib. p. 1073. Being at *Hatfield* the other Day, I was told by ſeveral Gentleman, that about 20 Years ago dyed one *Saunderſon* of that Town, aged near 80

80 Years, whoſe Father much of the ſame age, did frequently aſſure him, and other Gentlemen that were curious in the Matter, that he could very well remember many hundreds of great Fir-Trees, ſtanding one here and another there, in a languiſhing decaying Condition, half as high as Houſes, and ſome higher, whoſe tops were all dead, yet their Boughs and Branches always green and flouriſhing, growing all of them in theſe Levels: And *John Hatfield*, Eſq; who is not above 40 Years of age, has by him a large Twig that his Father pluck'd off from the Sprout of a green and flouriſhing Shrub of Fir that grew from the great Root of one of the ſame kind in theſe Commons. And an old Man of *Croul* tells me, That he has heard his Father ſay, that he could remember Multitudes of Shrubs and ſmall Fir-Trees growing here while this Country was a Chace, and while the Vert was preſerv'd, before the Drainage. And laſtly, In many old Charters that I have ſeen of the pious *Roger de Mowbray*, Lord of *Axholm*, who liv'd in the Year * 1390. relating to *Hurſt*, *Bellwood*, *Roſs*, *Santoft*, *&c.* it appears that then all theſe places were cover'd with a great old decaying Forreſt or Wood; and not them only, but alſo all that low Common between *Croul* Cauſey and *Authrop* upon *Trent*; and tho' there be not one ſtick of any ſuch thing now to be ſeen, yet it is not only plainly manifeſt that the ſame was true from the Roots there found, but alſo from the ſaid Roots, that moſt of the Trees that grew there were Firs. All which were but the after-growth, and Relicts of the famous great Foreſt formerly deſcribed unto you, that was deſtroyed by the conquering *Romans*.

* *The Author obſerves afterwards,* viz. *n* 277 p. 1077. *that he liv'd in* 1100. *which makes the Relation more remarkable.*

Subterraneous Trees in Dagenham, *and other bordering Marſhes, by Mr.* VVill. Derham, *n.* 335. *p.* 478.

XIX. The Inundation at *Dagenham* in *Eſſex*, happened in 1707. by a Breach in the *Thames* Wall, at an extraordinary high Tide; and by means of the great Violence of the Water, a large Channel was torn up, or Paſſage for the Water of 100 Yards wide, and 20 Foot deep in ſome Places; and in ſome more, ſome leſs. By which means a great number of Trees were laid bare, that had been there interred many Ages before. The Trees were all, as far as I could perceive, of one ſort, except only one, which was manifeſtly a large Oak, with the greateſt part of its Bark on, and ſome of its Head and Roots. The reſt of the Trees the Country People take to be *Yew*: And ſo did I myſelf imagine them to be, from the Hardneſs, Toughneſs, and weight of the Wood; but *D'Acre Barret*, Eſq; convinced me they might probably be ſome other Wood, as *Alder*; which grows plentifully by our freſh Water Brooks. And lately he told me, He had the Opinion of an ingenious and good Judge of Wood, who takes it to be *Horn-beam*, which grows plentifully alſo with us in the higher Lands (but I do not remember to have ſeen it in watery Places near us) but I rather incline to the Opinion of its being *Alder*; the Grain of the Wood, and manner in which the Boughs grow, *&c.* much reſembling that of *Alder*, more than *Horn-beam*. By lying ſo long under Ground, the Trees are become black and hard, and their Fibres are ſo tough, that one may as eaſily break a Wire of the ſame

Size, as any of thoſe Fibres. This Toughneſs they maintain, if the Wood be kept dry, as I find by two of the Trees I have now by me. But by drying, thoſe Trees are become cracked, and very flawy within, but look ſound outwardly, and with Difficulty yield to Wedges. But for the Trees lying in the Marſhes, which are covered by every Flood, and laid bare by every Ebb, in a ſhort time they become very rotten.

There is no doubt but thoſe Trees grew in the Place where they now lie, and that in vaſt Multitudes; they lying ſo thick upon, or near one another, that in many places I could ſtep from one to another. And there is great reaſon to think, that not only the Marſhes, which are † now over-flown (which are about 1000 Acres) are covered underneath with thoſe Subterraneous Trees, but alſo all the Marſhes along by the River ſide, for ſeveral Miles: For we diſcover theſe Trees all along the *Thames* ſide over againſt *Rainham*, *Wennington*, *Purfleet*, and other places: And in the Breach that happened at *Weſt-Thorrock* about 21 Years ago, they were waſhed out in as great Numbers (as I have been informed) and of the ſame kind of Wood, as thoſe found lately in *Dagenham* and *Havering* Levels.

† *In* 1712.

Theſe laſt mentioned Trees are of different Sizes; ſome above a Foot Diameter, ſome leſs. As I was rowed in a Boat along the Channel, I met with two of the leſſer ſort, ſtanding upright, in the ſame poſture in which they grew; their Tops juſt above Low-water, and their Bottoms (at leaſt the bottom of the Channel) at 16 Feet depth. We endeavour'd to draw them out, but could not do it with all our Strength. They ſeemed to be about two Inches Diameter in their Trunk, had ſome of their Boughs on, were dead, and in all likelihood, being young and light, eſcaped the force of what threw the other more large, and unweildly ones down. Moſt of the Trees, that I met with, had their *Roots* on, and many of them their *Boughs*, and ſome a part of their *Bark*. There was only one that I perceived had any Signs of the *Ax*, and its Head had been lopped off.

As I paſſed the Channel which the Water had torn up, I could ſee all along the Shores vaſt Numbers of the *Stumps* of thoſe Subterraneous Trees, remaining in the very ſame poſture in which they grew, with their Roots running ſome down, ſome branching and ſpreading about in the Earth, as Trees growing in the Earth commonly are ſeen to do. Some of thoſe Stumps I thought had ſigns of the Axe, and moſt of them were flat at top, as if cut off at the Surface of the Earth: But being rotten, and batter'd, I could not fully ſatisfy my ſelf, whether the Trees had been cut, or broken off. The *Soil*, in which all thoſe Trees grew, was a black ouzy Earth, full of the Roots of Reed; on the Surface of which ouzy Earth the Trees lay proſtrate, and over them a Covering of grey Mould, of the ſelf ſame colour and conſiſtence with the dry Sediment or Mud, which the Water leaveth behind it at this Day. This Covering of grey Earth is about 7 or 8 Feet thick, in ſome places 12 Feet or more, in ſome leſs; at which depths the Trees generally lye.

The *Poſture* in which they lay, was indeed in no kind of Order, but ſome this way, ſome that, and many of them acroſs: Only in one or two places I obſerv'd they lay more orderly, with their Heads for the moſt part towards the North, as if they had been blown down by a Southerly Wind, which exerts a pretty ſtrong force upon that Shore.

As to the *Age* in which thoſe Trees were interred, it is hard to determine. Many think they have lain in that ſubterrane State ever ſince *Noah*'s *Flood*. But although I have not the leaſt doubt but that at this Day we have many Remains of the Spoils of that Deluge, even in the higheſt Mountains, yet I rather think theſe Trees to be the Ruins of ſome later Age, occaſioned by ſome extraordinary Inundations of the River of *Thames*, or by ſome Storms, which blow ſharply upon this Shore: Either of which Acts of Violence might be able to root up, and tumble down Trees growing in ſo lax a Soil, as theſe manifeſtly grew in at that time. And as for extraordinary *Inundations* of the *Thames*, there is at this Day a Mark, which if occaſioned by an Inundation, was the Mark of an Inundation very prodigious, beyond all ever known to have been in that River; and that is a *Bed of Shells*, if not of a kind of Marble too, lying croſs the High-way on the Deſcent near *Stifford-bridge*, going from S. *Okendon*: Below this Bed of Shells, at above 50 or 60 Yards diſtance, in the bottom of the Valley, runneth a Brook, that empties it ſelf into the *Thames* at *Purfleet*, about 3 Miles from thence; which Brook ebbeth and floweth as the *Thames* doth, but not at any certain height, by reaſon of Mills ſtanding thereon; but above a pretty High-water in the Brook, the Surface of the Bed of Shells I find to lye above 20 Foot perpendicular. Conſequently if this Bed of Shells was repoſited in that place by an Inundation of the *Thames*, that Inundation muſt be ſuch as would have drowned a vaſt deal of the adjacent Country, and have overtopped the Trees by the River, in *Weſt-Thorrock*, *Dagenham*, and the other Marſhes, and probably by that means over-turn them. This ſeems to me the moſt rational way of accounting for our Subterraneous Trees, and not by the *Univerſal Deluge*: For had they been left there by that Deluge, we ſhould not find the bed of Earth, in which they grew, ſo entire and undiſturb'd, as it manifeſtly is at this Day, a ſpongy, light, ouzey Soil, full of Reed-roots, as I ſaid; and I aſſure my ſelf (although I never try'd it) of much leſs Specifick Gravity than the *Stratum* above it is. Whereas I can affirm, that in three places where I have try'd it, the *Strata* are in a ſurprizing manner gradually ſpecifically heavier and heavier, the lower and lower they lie.

Having given this Account of their *Proſtration*, let us laſtly enquire into the *Manner how theſe Trees came to be interred.* And this I take to be from the gradual increaſe of the Mud or Sediment, which every Tide of the *Thames* left behind it. I preſume thoſe Trees might be thrown down before the Walls or Banks were made, that keep the *Thames* out of the Marſhes; and then thoſe Trees were overflown every Tide. And by reaſon they lay thick, and near one another on the Ground, they would ſoon gather a great deal of the Sediment, and be ſoon covered therewith. And after the *Thames*-Walls were made, every Breach in them, and Inundation would leave great quantities of Sediment behind it; as I by a troubleſome Experiment found, in going over ſome of the Marſhes, ſoon after the late Breach, where I found the Mud generally above my Shoes, and in many places above my Knees. And it is a practice among us (of which we have divers Inſtances) that where a Breach would coſt more to ſtop, than the Lands overflown will countervail, there to leave the Lands to the Mercy of the *Thames*; which by gradually growing higher and higher, by the Additions of Sediment, will in time ſhut out the Water of the River, all except the higheſt Tides. And theſe Lands they call *Saltings*, when covered with Graſs; or elſe they become *Reed-ground*, &c.

That it was the Sediment of the *Thames*, that buried thoſe Trees, is farther manifeſt from what I ſaid before, of the likeneſs of the Earth above them, in all reſpects, to the Sediment the River now lets fall, when dry; which may be obſerv'd to conſiſt of many diſtinct Layers; ſome $\frac{1}{10}$ of an Inch thick, ſome leſs, and ſome ſcarce $\frac{1}{30}$ of an Inch. All which ſeveral Layers are, no doubt, the ſeveral quantities which every Tide left behind it. This Sediment, when dry'd by the Sun and Wind, becomes tough and hard, and looketh like a grey *Lapis Sciſſilis*, or *Slate*, diviſible into many Plates or Layers. And what if we ſhould aſcribe the Conformation of *Slate*, *Muſcovia-glaſs*, and other the like laminated Concretions, to a like Work of Nature, by adding new Layers of ſuch Petrifactions, and Particles, as the Foſſile is made of?

I find that *Alder-Wood*, whether green or old, becomes blackiſh, much of the ſame colour as the Wood before mentioned in this Paper, in a Solution of Copperas. Which is not only an Argument, that the blackneſs of the Wood is owing to Vitriol, but alſo that the Wood is *Alder*, or ſome ſuch like Wood, that will become black with Vitriol: For I am inform'd that all Subterraneous Wood is not black, particularly Firr. I have alſo try'd *Hornbeam* ſince, after the ſame manner, and find that alſo becomes black, as the *Alder* doth.

Of the Moſſes in Scotland, *by the Earl of* Cromertie, *n.* 330. *p.* 296.

XX. There are many Grounds in *Scotland*, which we call Moſſes, whence the Country People dig Turf and Peat. The Scurf is cover'd with a heathy, and as they call it a heathery Scurf; and under the Scurf is a black, moiſt, ſpongy Earth; in ſome Places ſhallower, in others deeper; from 3 or 4 to 7 or 8 Foot deeper; and in ſome places, but not many, to twice or thrice the depth. They cut the heathy Scurf with a flat kind of Spade, which they force horizontally betwixt the Scurf and the foreſaid ſpongy Earth; and ſo turn up the Scurf in flat thin Flakes, which they call Turfs. 'Tis readily over-runn'd with the ſmall Roots of Heath or Heather, and when dried makes a healthy briſk Fire; but with much Aſhes, of a whitiſh, duskiſh or reddiſh colour; always the whiter as it contains the more of the woody Roots.

The black ſpongy Earth, which is under the Turf, they cut out in oblong Squares, with Iron-Spades made of that Shape, about 8 or 9 Inches long, and about 4 or 5 Inches broad: And as the Men cut them up, the Weaker Men, Women and Children, carry them in ſmall Wheelbarrows, ſcattering them on ſome dry Ground, to be dried by Sun and Wind: Some become harder, ſome ſofter, according to the Nature of the Mould, or Earth; the more ſolid, the better Fire; and they are leſs eſteemed, which are more ſpongy. And when they have cut off one Surface, of four or five Inches deep, they proceed downward to another; until at laſt, they come to the hard Channel, unleſs they be ſtopped by Water; which alſo they ordinarily remove by making a Channel to ſome Deſcent, if they can; and if they cannot, there the Water ſtagnates. And in ſuch waſted Pits, where Water hinders to cut the ſpungy Earth to the bottom; the Pits will be filled up again, in a good number of Years, with new Ground, of ſpungy Earth; which in Progreſs of Time, will come to the Conſiſtency of Peat-Moſs, as at firſt, and a ſcurfy Heath Turf will at laſt grow on the top of it.

I have obſerv'd, That Peat-Pits, which have been digged ſince I remember, to have grown up again with new Peats; and that ſometimes oftner than once, in the ſame Pits; ſome Moſſes growing in ſhorter time than others. But I have obſerv'd alſo, That when they dig the Peats to the Channel, and in Places where the Water runs off, and doth not ſtagnate, that the Moſſes did not grow, nor renew there again. Which moved me to order my Tenants, not to cut the Moſſes to the Channel, nor in very large Openings; but rather in ſmaller Pits, that they may grow again more haſtily: And the Event hath anſwer'd my Deſign. But within theſe few Days, Sir *Robert Adaire*, (a moſt Ingenious Gentleman) told me, That without cutting the Moſſes, in the Method of Pits; but by cutting in fully to the Channel, and by laying the heathy Turf, which is cut off the top of the Moſs; he ſaid, by laying it on the Channel, ſo as to cover the Channel over, that in Progreſs of Time a Moſs would grow there again; but not ſo haſtily as in the Pits. I never obſerved any of theſe Moſſes, which did not ſtand on Plains: Albeit the heathy, or heathry Turf, do over-ſpread the Faces and Declivities of the *Scots* Mountains, for the moſt part; there are many Moſſes, which ſtand very high on theſe Hills; yea, ſometimes not very far from the top. But the Peat Moſſes are always in a Plain, though there be Deſcents to them, and Deſcents from them; yet I never obſerved them to ſtand on ſuch a Plain, as the Water might ſtagnate on: And they always have a Deſcent to them, from ſome higher Grounds, whereby Water did deſcend to that Plain; which I take to be the Parent of Peat. Thus much of the Moſſes in general.

In many of theſe Moſſes, there is found quantities of Firr and Oak Wood; for, as I ſaid, I never obſerved nor heard of other Woods in them. Theſe are ordinarily found in whole Trees; but the ſmaller Branches are ſeldom found unconſumed. I have ſeen very many, and very great Trees of both kinds: But generally ſpeaking, the Oak is always black; the Firr ſometimes whiter, ſometimes redder, as is obſerv'd in all Firr Woods: But neither Firr nor Oak are found with any Bark upon them. The Firr is generally as freſh and tough, and as fit for any Uſe, as any other old Wood is: Only the Wood of theſe found in Moſſes, has ſo imbibed the Water, that it takes a long time to dry, and fit it for Uſe, eſpecially the Oak; inſomuch, that when it is put into any ſmall Work, it readily warps and changes its Figure. We never find any of the Oaks ſtanding in the Woods have that Blackneſs; ſo that I preſume, the Blackneſs accrues from the Water.

There are many Places, where Woods do not now grow; albeit, People endeavour to cultivate them; and yet the Moſſes in theſe Places are well ſtored with this kind of under-ground Timber, both Oak and Firr, but eſpecially Firr; ſuch are *Orkney*, the *Lewes* (which are Iſles,) *Cathneſs*, *Tarbartneſs*, and the Coaſt of *Buchan*. But yet it would appear, that there have been Woods of old in theſe Places, or how elſe could they come to theſe Moſſes: And for a farther Proof of this Inference, be pleaſed to take Notice of the following Account.

In the Year 1651. I being then about 19 Years old, and occaſionally in the Pariſh of *Lochbrun*, paſſing from a Place called *Achadiſcald*, to *Gonnazd*, I went by a very high Hill, which did riſe in a conſtant Steepneſs from the Sea; only in leſs than half a Mile up from the Sea, there is a Plain about half a Mile round; and from thence the Hill riſes in a conſtant Steepneſs, for more than a Mile in Aſcent. This little Plain was at that time all covered over with a firm ſtanding Wood; which was ſo very old, that not only the Trees had no green Leaves, but the Bark was totally thrown off; which the old Countrymen, who were in my Company, told me, was the univerſal manner in which Firr Woods did terminate; and that in 20, or 30 Years after, the Trees would ordinarily caſt themſelves up from the Root; and that they would lie in heaps, till the People would cut them, and carry them away. They likewiſe did let me ſee, that the outſide of theſe ſtanding white Trees, and for the ſpace of one Inch inward, was dead white Timber; but what was within that, was good ſolid Timber, even to the very Pith, and as full of Rozin as it could ſtand in the Wood.

Some fifteen Years after, or thereabouts, I had occaſion to come the ſame way; and call'd to mind the old Woods which I had ſeen. Then there was not ſo much as a Tree, or appearance of the Root of any; but in place thereof, the whole Bounds, where the Wood had ſtood, was all over a plain green Ground, covered with a plain green Moſs. I asked the Country-People, who were with me, what became of the Wood, and who carried it away? They told me, no body was at the Pains to carry it away; but that it being all over-turn'd from the Roots by Winds, the Trees did lie ſo thick and ſwarving over one another, that the green Moſs (there, in the *Britiſh* Language called Fog) had over-grown the whole Timber; which they ſaid, was occaſioned by the moiſture that came down from the high Hill, which was above it, and did ſtagnate upon that Plain; and they ſaid none could paſs over it, becauſe the Scurf of the Fog would not ſupport them. I would needs try it; and accordingly I fell in to the Arm-Pits, but was immediately pulled up by them. Before 1699. that whole piece of Ground was turn'd into a common Moſs; where the Country-People are digging Turf and Peats, and continue ſo to do. The Peats as yet are not of the beſt, and are ſoft and ſpungy, but grow better and better; and as I am inform'd, it does now afford good Peats. This Matter of Fact did diſcover the Generation of Moſſes; and whence it is, that many Moſſes are furniſh'd with ſuch Timber.

Theſe Highland Woods are ordinarily ſtored with other kind of Timber, as Birch, Alder, Aſh, beſides Shrubs, and Thorns; yet we never find any of thoſe Woods remaining in the Moſſes. Whilſt I ſpeak of Moſſes, allow me to add this, (*viz.*) That in a Moſs near the Town of *Elgin* in *Murray*, though there be no River or Water that runs into the Moſs, yet three or four Foot in the Moſs, there is a ſort of little Shell-Fiſh reſembling Oyſters, found numerouſly in the very body of the Peats, and the Fiſh alive within them; though no ſuch Fiſh be found in any Water near to that Moſs, nor in any adjacent River; no, nor in the ſtagnating Pits, that are in that Moſs; but only in the very ſubſtance of the Turf: Some of which were ſent to me from the place, a little before I came from *Scotland*.

An Anſwer to the foregoing, by Sir Hans Sloane, *ib. p.* 302.

XXI. I have ſeen many ſuch in the North of *Ireland*, and know your Lordſhip's Account of them to be very exact and true. I have likewiſe been an Eye-witneſs there, that when the Turf diggers have come to the bottom, or firm Ground, by having dug out all the Earth proper to make Turf or Peat, and come to the Clay or other Soil by draining off the Water, that then there have appeared Roots of Firr Trees, with their Stumps ſtanding a Foot or two ſtrait upright, and their Branches ſpread out on every ſide horizontally on that firm Surface; as if that had been formerly the outward Face of the Ground, and place of their Growth. And I remember to have obſerv'd theſe Roots to be ſometimes ſo near one another, as that their Branches were as it were matted, grew over, and gave place to one another, as we every day ſee in Roots of Trees where they grow too cloſe. I ſaw once the body of a Firr Tree dug up ſo big, as to be judg'd fit for the main Poſt of a Wind-Mill; which was diſcover'd, as many of them which are not found in digging Turf are, by the Graſs which grew over it being in a very dry Summer of a yellowiſh colour.

The Reverend Mr. *de la Pryme* ſent me ſome of the Cones found with this Timber in the great Fenns of *Lincolnſhire*, which differed in nothing from thoſe of the *Scotch* Firr, which your Lordſhip has ſo plentifully growing in *Scotland* at this Day, and which ſome Years ſince were judged ſo proper by ſome to afford Maſts for the Navy Royal, that I think ſome Perſons were ſent thither for that purpoſe. But they were not able to bring about what they intended, by reaſon of the Difficulties in the Roads by which they were to be conveyed to the Sea; which in *Norway* I have heard is in a great meaſure effected by the Rivers. *Cæſar*, indeed, in his Commentaries ſays, That the ſorts of Timber in this Iſland are the ſame as in *France*, *præter fagum & abietem*, except Beach and Firr. Your Lordſhip is a ſufficient Witneſs of his Miſtake as to one ſort of theſe Trees, and the Beaches in the *Chiltern* Countries near *London*, prove the ſame as to the other. For the Uſes of this underground Timber, beſides thoſe of other Wood, it is ſplit into pieces; and being lighted, ſupplies the uſe of Candles. It is alſo made into Ropes; as may be ſeen in the *Muſæum* of the Royal Society, by a long piece of ſuch Rope, bought by the Honourable *Edward Southwell*, Eſq; in *Newry* Market in *Ireland*, and preſented by him to the Royal Society; the long ſoaking in Water having render'd the Wood of thoſe Trees fit to be made into Ropes. This ſeems to prove, that as the ſoaking of Hemp, Flax, Aloe Leaves, *&c.* in Water, diſſolves the pulpy part, and leaves the fibrous fit for making into Threads and Ropes, ſo the long ſoaking of Trees may make in length of time the ſame, or an analogous change in thoſe of Wood and Timber. I have ſeen what I thought had been pieces of Wood, not only in Clay Pits, but even in Quarries or Stone Pits, in the Blocks of Stone raiſed out of their *Strata*, or Layers; and have been aſſured by Mr. *Bellers*, he hath ſeen large pieces of Wood in the Stone Pits in *Glouceſterſhire*; and alſo that in *Lancaſhire* there is a Moſs, or Turf Bog, where the black ſpungy Mould, made uſe of for Peats, ſmells very ſtrong of *Bitumen*, or *Petroleum*; of the Oil of which it yields a very great quantity by Diſtillation. And the late Sir *Edward Hannes* told me, that near the Lord *Bleſſington*'s Houſe at *Bleſſington* in *Ireland*, there appeared a Light where the Horſes trampled with their Feet on a certain ſpace of ſoft Ground. On my deſire he procured me ſome of this Mould, which I have yet by me, and which agrees exactly in its dark colour, lightneſs, *&c.* with Peat Earth. And on Examination of this by a Microſcope, I found the light proceeded from many ſmall half, tranſparent whitiſh live Worms, which lay in it.

The blackneſs of the Oak, which your Lordſhip mentions, comes, in my opinion, from the Vitriolic Juices of the Earth ſoak'd into the Oak, which being aſtringent is turned black by them. Your Lordſhip knows that Ink is made of Galls, an aſtringent Excreſcence of a ſort of Oak in *Turkey*, made by an Inſect there; and of green Vitriol, which is made of the Pyrites diſſolv'd by Rain Water, and Iron. Earth of all ſorts, and even human Calculi, and the Aſhes of Vegetables, have in them Particles of Iron, in greater or leſſer quantities. The Pyrites is alſo very common. The Particles of Iron coming to be diſſolv'd by this Pyrites, Subacid, or other Salts diſſolv'd by Water, or perhaps by Water it ſelf, and carried into theſe Bogs, there faſtens to the Tree, ſoaks into it, and turns it black.

Theſe Particles in ſome River Water, faſtening to the Oak Timber floated in it, give the ſame a darkiſh colour; taken notice of by Mr. *Pepys* in his Naval Memoirs of *England*, p. 71. where we are told by the moſt famous Ship-Builders of *England*, " That the beſt Foreign " Plank for the Royal Navy was brought either from *Dantzick*, *Quin-* " *borow*, (that is *Koningsberg*,) or *Riga*, of the Growth of *Poland* and " *Pruſſia*, or from *Hamburgh*; namely, that ſort thereof which is ſhipp'd " from thence of the Growth of *Bohemia*, diſtinguiſh'd by its Colour, " as being much more black than the other, and rendred ſo (as is ſaid) " by its long ſobbing in the Water during its Paſſage thither."

In the Turf Bogs of *Ireland* 14 Foot deep, are found not only the Mouſe-Deers-Horns, mentioned * in one of theſe Tranſactions, but likewiſe their whole Sceletons, wherein the Bones bear the ſame proportion to the like Bones of other Deer, as the Horns bear to their Horns. There are alſo found therein Gold Chains, Pieces of Money, and Roots of Heath, ſeveral *muſci*, and Branches of Trees ſo ſoft, as to give no reſiſtance to the Turf Spade: And I was told, That in cutting Turf in one, they at ſeveral Feet deep cut through what the *Iriſh* call a Ruskin of Butter (which was a Firkin or Veſſel, made of the Barks of Trees, uſed by the old *Iriſh* for putting up their Butter.) And I remember, that in digging the wet Dock at *Deptford*, there were found at the bottom, about nine Foot deep, Graſs Leaves, Hazle Nuts, and Roots of Trees: And there alſo was found a piece of Money, as they call'd it; which was ſent me by Mrs. *Willoughby*, and it prov'd to be a Leaden Seal to ſome Bull of Pope *Gregory* the IX. who continued Pope from the Year 1227 to 1241.

* *Abr. Vol.* II. *p.* 432.

There are ſeveral Paſſages in *Lelands Itinerary* Vol. V. † which have a near relation to theſe Matters, and ſhew the common Opinion in his Days of the cauſe of the Deſtruction of Woods, the growing of Moſſes and Pools; and that, at that time, in *Wales*, the Senſe of the Inhabitants was, that the under-ground Trees found there had formerly grown there.

† *p.* 13. *p.* 67. *p.* 63. *p.* 75. *p.* 79. *p.* 81.

XXII. *Papers Omitted.*

1. A Deſcription of ſome Shells brought from the *Molucca* Iſlands, by Mr. *Sylvanus Landon*, and Mr. *Rowleſton Jacobs*. By Mr. *James Petiver*, R.S.S. *n.* 274. *p.* 527.

2. A Deſcription of ſome Corals, and other Submarines lately ſent by the Reverend *George Joſeph Camelli*, from the *Philippine* Iſles. By Mr. *James Petiver*. *n.* 286. *p.* 1419.

3. Catalogus Concharum, Foſſilium, Metallorum, Mineralium, *&c.* quæ a Cl. D. *Johanne Jacobo Scheuchzero* M. D. *Tiguri*, & R. S. S. nuper accepit D. *Jacobus Petiver*. *n.* 301. *p.* 2042.

4. Mineralia quædam, Conchylia petrifacta, & alia Foſſilia e *Berolina* a Cl. *Chriſtian. Maximiliano Spenero*, Doct. Med. Reg. Pruſſ. Aul. Acad. *n.* 302. *p.* 2032.

Acad. S. R. J. Cur. & Soc. Scient. Reg. Brandenbug. Colleg. ad Amicum ſuum curioſiſſimum, D. *Jacobum Petiver*, Pharmacop. Londin. & R. S. S. miſſa.

n. 311 *p* 2397. 5. De Conchyliis Turbinatis, Bivalvibus & Univalvibus, item de Mineralibus, Foſſilibus & Thermis Philippenſibus, ex MS. R. P. G. J. *Camel*. Communicavit *Jac. Petiver*.

n. 314. *p.* 77. 6. An Advertiſement of ſeveral Specimens of figured Foſſils, which may be had of Mr. *Alban Thomas*.

n. 337. *p* 222. 7. A ſhort Account of ſome *Swediſh* Minerals ſent by Mr. *Angeſtein*, Overſeer of the King of *Sweden*'s Mines, to Mr. *James Petiver*.

XXII. *Account of a Book Omitted*,

*n.*291. *p.* 1604. Specimen Lithographiæ Helveticæ, quo Lapides ex Figuratis Helveticis ſelectiſſimi Ære inciſi ſiſtuntur & deſcribuntur, a *Joh. Jac. Scheuchzero*, M. D. *Tiguri*, 1720. 8vo.

CHAP. IV.

Magneticks.

1. *Some Magnetical Experiments and Obſervations, by Mr.* Derham, *n.* 303. *p.* 2136.

HAving touched a piece of Wire, ſo that it ſtrongly tended N. and S. I was minded to ſee whether it would have any Inclination to either of the Poles of the World, when turned round like a Ring, ſo that the two ends of the Wire met. And having again ſtraitned it, I was ſurprized to find it had quite loſt its *Verticity*. The cauſe of which I preſently concluded to be the Contact of the Northern and Southern ends of the Wire, which I thought might ſo influence one the other, as to confuſe its Poles; although I confeſs I had never obſerved any ſuch Confuſion to ariſe upon the bare contact of the Northern and Southern ends of two other touched pieces of Wire. Upon this I touched ſtrongly the ſame, and other pieces of freſh Iron Wire, and having found them all greedily to turn N. and S. I coyled them round ſo as that the ends ſhould not come near one another, and again ſpeedily opened them ſtrait; and found as before, that every piece had utterly loſt its *Verticity*: Nay, the *Magnetick Virtue* was ſo abſolutely deſtroyed by bending the Wire, that it had not only loſt its Inclination to either Pole, but the two ends of each Wire ſeemed indifferent to the Poles of the *Load-ſtone*, *viz.* whereas before the bending, the adverſe Poles of the *Loadſtone* would repel, and the Similar Poles attract the adverſe, or Similar ends of the Wire: Now the repulſive Virtue was quite extinguiſhed, and either end would indifferently be attracted by either Pole of the Magnet; all one as if the Wire had been heated red hot (which is well known to deſtroy the Virtue) or never had been touched at all.

This I experimented over and over again upon Wires of different lengths, with the ſame Succeſs. Only this muſt be obſerved, if you only bend the Wire round, ſo as that it ſhall ſpring back into its place, or recoil, ſo as to be near the ſame Straitneſs, that then no ſuch, or but little of ſuch Effect, will enſue. But to produce this Effect, the Wire muſt be *ſharply* bent, ſo as that *violence* may be exerted upon it. If it be coyled two or three times round a ſmall round Stick, it will beſt ſucceed. And farther alſo, it is neceſſary that every part of the Wire ſhould be bent, to evacuate the Magnetick Virtue: For if the ends, or any other part happen not to ſuffer the violence of bending, that part ſhall retain its Magnetiſm. As for inſtance, if the Wire be all coyled, except half an Inch, or indeed half a tenth of an Inch at each end, every part ſo coyled ſhall both loſe its Verticity, and ſhall incline indifferently to either Pole of the Magnet; but the two ends, (although not able to turn the whole Wire N. and S.) ſhall fly from, or tend unto the reſpective Pole of the Magnet: Or if every part of the Wire be coyled, except a ſmall bit at one end only, all that coyled part, when extended, ſhall utterly be deprived of its Magnetiſm as before; and only that uncoyled bit retain its Averſion or Inclination to the Magnetick Poles. From the Conſideration of all which Particulars, it is manifeſt, that the violence exerted upon the Wire by bending doth utterly extirpate the Magnetick Virtue, or at leaſt make ſuch a Confuſion therein, that it is as if wholly deſtroyed. *p.* 2138. But the Experiment not ſucceeding in ſome Tryals ſince, I have had reaſon to fear the Society might call my Integrity in Queſtion.

The matter of Fact was thus, and to me ſurprizing: I touched and coyled ſeveral Iron Wires, but the Effect that enſued was not ſuch as I told the Society. The Verticity was indeed much weakned, but not totally deſtroyed, and the ends of the Wires would be attracted or repelled by the Poles of the Magnet; whereas I ſaid they uſed only to be attracted. The next Morning I tryed again: And then the Magnetiſm of the Wires was totally deſtroyed, as I before related. This Experiment I repeated divers times, and on divers Wires this Winter, and commonly find, that all the Day, coyling will evacuate the Magnetiſm: But that it will not abſolutely do it in the Evenings. But whether it will do ſo in Summer, or all Weathers, or whether it ſucceedeth thus only in different times of the Day, I muſt leave to farther Tryals. I well know that the Orb of the Activity of Magnets is larger, or leſs, at different times. That noble Magnet in the Society's Repoſitory found in *Devonſhire* by Dr. *Cotton*, is known in ſome Weathers (or at ſome times) to keep a Key, or other piece of Iron, ſuſpended to another Iron at 8, 9 or 10 Foot diſtance. But at other times, the Iron will drop down at the diſtance of 3 or 4 Foot from the Magnet. If I lived nearer, I would obſerve the *Phænomenon* more nicely: Particularly whether there be any difference therein in the Evening, and the reſt of the Day.

Finding the Caſe thus with *Coyled*, or *bent Wire*, I was minded to try the Event of *Twiſting* of Iron Wire from end to end, after it had been well touched. The Succeſs was, The *Verticity* was always weakened, and ſometimes inverted. And when it was ſo, the Load-ſtone did accordingly commonly Repel or Attract, all one as if the twiſting the Wire had given a new Touch the contrary way. But in ſome Wires ſo twiſted, the Verticity was wholly deſtroyed, or rather much confuſed. For I found by drawing one of the Poles of the Loadſtone along near the ſides of the Wire, that in ſome places it would Attract, in others Repel, and ſo attract and repel all along the Wire. Nay, I fancied in ſome places, that one ſide of the Wire would be attracted, the other repelled by one and the ſame Pole of the Loadſtone. To theſe odd Changes, I could add divers others, which the *Twiſting* produced. But theſe do ſufficiently ſhew that the Magnetick Virtue is put into great Confuſion by the Violence exerted upon the Wire by *Twiſting*: Which not only ſeparateth the Fibres of the Iron (as may be ſeen with the Eye, eſpecially aſſiſted with a Microſcope) but alſo changeth their Situation from Longways to Skrew-ways.

In *Cleft Wires* the Caſe is very uncouth. Oftentimes the Poles are quite changed; ſo that what was the *North*, becometh the *South* Pole of the Wire in all reſpects; I mean, not only turning, but alſo embracing, or avoiding the Poles of the Loadſtone, as if it had received a new, and contrary Touch. Sometimes one half of the Wire will retain its Magnetiſm, which it had before ſplitting, and the other half have it quite changed. Sometimes no change at all will enſue, only the Magnetiſm be much weakned; as indeed it always is in all the Experiments where the Wire is ſplit. (But generally, where one of the halves hath ſuffered change, the other not, I have obſerved, That 'tis the thinneſt and weakeſt that hath been changed, and the thickeſt hath retained its Touch.) Sometimes where one of the ſplit Halves receiveth an *inverted Verticity*, or ſeemeth to have no Verticity at all, one of its Ends will incline to one of the Poles of the Magnet, not according to its Touch, but in an inverted Order, and the other end be attracted indifferently by both the Poles of the Loadſtone. And in ſome Caſes, that End ſhall be attracted by one Pole, but be neither attracted nor repelled by the other; but ſtand as it were heſitating whether it had beſt fly to, or from that Pole of the Loadſtone. Only if that Pole of the Magnet be too near, then that end of the Wire will conſtantly fly thereto: As indeed it is the nature of all Magnets and Magnetick Bodies to do, when they touch, or approach very near one another, though they repelled before.

There is one thing very ſurprizing, which will deſerve to be mention'd, viz. *That the laying one, or the other ſide Half uppermoſt*, will cauſe a great Alteration in its Tendency, or Averſion to the Poles of the Magnet (as I have ſaid.) But if you lay the contrary ſide of that half upper-moſt, the ſame end ſhall be attracted by one, and repelled by the other Pole of the Magnet. In other pieces, where the ends are regularly attracted or repelled, only in an inverted order (as if new touched,) if it lay with the round ſide uppermoſt at that time, and be then turn'd upſide down, *viz.* the flat cleft ſide uppermoſt, 'tis ten to one if one of the Ends be not either attracted by both the Poles, or repelled by both; or elſe attracted or repelled by one, and heſitates as to the other: For ſo it often befalls. The Cauſe of this lubricity of the Magnetiſm I imagined might be, becauſe the ſides or edges of the Wire had received contrary Poles by ſplitting: And conſequently were turned topſy-turvy, that what was the N. might then be the S. edge of the half. But I could never diſcover, but that the ſides of each end, or of any other part, were the ſame, when I held the Loadſtone to one or the other ſide. Which indeed I always did in every Experiment for greater certainty ſake.

I was minded to repeat the old Experiment of touching Wires, *by rubbing them backwards and forwards* with one of the Poles of the Loadſtone, becauſe it might probably give ſome Light into the afore-mentioned ſtrange *Phænomena.* This I tryed, and found what is ſaid, not only to be true, but alſo that the Reaſon thereof is, *Becauſe the Poles of the Wire or Needle, ſo touched, are not at the ends, but in, or near the middle of the Wire or Needle.* Sometimes one is near the Center, the other at one or both ends. For in ſome Wires ſo touched, both the ends of the Wire would be attracted by one Pole of the Loadſtone, and repelled by the other. And in ſuch Caſe the repelling Pole always found a Sympathetick part near the Center of the Wire. In others (eſpecially where a Verticity ſucceeded, as ſometimes it will do, and that pretty ſtrongly too, in ſuch a Caſe) the Verticity would be inverted, and the ends of the Wire be attracted and repelled in a direct contrary manner to the natural Form. And the reaſon of all this will be manifeſt from theſe following Experiments.

I touched a Wire from end to end with only one Pole of the Magnet. This gave ſo vigorous a touch, that I am almoſt of opinion, *It is the beſt way of touching.* The Conſequence was, the end where I began always turned contrary to the Pole that touched it. I again touched the ſame Wire, and others too with the other Pole of the Magnet, from the ſame end, and then that end turned the contrary way. *e. g.* Mark one end of a Wire for the North-end, and touch that Wire, by drawing the N. Pole of the Magnet divers times along the Wire from the N. to the S. end: This Wire ſo touched ſhall have a vigorous Verticity; but the North-end ſhall ſtand South. But if you touch that or another Wire, (for it is all one, becauſe the latter deſtroys the former Touch; I ſay, if you touch) by drawing the N. Pole of the Magnet from the S. to the N. end of the Wire, then this N. end will turn N. And ſo it will do the ſame, if you touch with the Southern Pole from the N. to the S.

There is one Experiment more doth yet give farther light into what goeth before, *viz.* I touched an Iron Wire exactly in the middle with only one Pole of the Loadſtone, without drawing it backwards or forwards. The Event was, That in that place that Pole of the Wire was, and the two Ends were the contrary Pole of the Wire; and were accordingly repelled or attracted by the Poles of the Loadſtone: And the middle, and an Inch or more on each ſide was attracted by the Pole only that touched it.

An Experiment of Magnetical Attraction, by Dr. Taylor, *n.* 344. *p.* 294.

II. Mr. *Hawskbee* and my ſelf in 1712. made an Experiment with the great Loadſtone belonging to the *Royal Society*, in order to diſcover the Law of Magnetical Attraction. On comparing the Numbers of this Experiment with that made ſince by Mr. *Hawskbee*, and publiſh'd in the *Phil. Tranſ.* No. 335. I find the Numbers of the former very much more regular; wherefore I conclude that to be the beſt Experiment, and ſince I have reaſon to believe Mr. *Hawksbee* loſt the Table I left with him for the Society, of the Numbers relating to it, I take leave here to give an Account of it.

We plac'd the great Loadſtone belonging to the *Royal Society*, ſo that its two Poles lay in the Plane of the Horizon; and were in a Line exactly at right Angles with the natural Direction of the Needle we made uſe of (which was that Dr. *Halley* had made to obſerve the Variations with;) and by means of a Carriage contriv'd for that purpoſe, the Stone was eaſily mov'd to and fro, the Poles continuing always in the ſame Line. The Needle was ſo plac'd, that the Center it play'd upon was in the ſame Line with the Poles of the Stone; the North Pole being towards the Needle. We meaſur'd the Diſtances from the Center of the Needle to the Extremity of the Stone; and found the Variations of the Needle from its natural Poſition, to be as in the following Table.

Diſtant.	Variation.		Diſtant.	Variation.		Diſtant	Variation.	
Feet.	°	'	Feet.	°	'	Feet.	°	'
1	81	45	4	16	00	7	3	30
2	58	00	5	9	20	8	2	20
3	30	00	6	5	35	9	1	35

A Defence of Dr Halley's *Map of Variations, n.* 341. *p.* 165.

III. It muſt be acknowledged that the Gentlemen of the *Royal Academy of Sciences* in *France*, have for ſome Years paſt, apply'd themſelves with much Candour, as well as Diligence, to examine the Chart I publiſh'd in the Year 1701, for ſhewing at one View the Variations of the Magnetical Compaſs, in all thoſe Seas with which the *Engliſh* Navigators are acquainted: And to my no ſmall Satiſfaction, I find that what I did ſo long ago, has been ſince abundantly verified by the concurrent Reports of the *French* Pilots, who of late have had frequent Opportunities of enquiring into the Truth thereof. So that I am in hopes I have laid a ſure Foundation for the future Diſcovery of an Invention, that will be of wonderful uſe to Mankind when perfected; I mean that of the Law or Rule by which the ſaid Variations change, in Appearance regularly, all the World over. Of this I have adventured long ſince to give my Thoughts in * N°. 148. and 195. of theſe *Tranſactions*, and as yet I ſee no Cauſe to rerract what I there offer for a Reaſon of this Change; but of this we might be more certain, had we a good Collection of Obſervations made in that Ocean, which divides *Aſia* and *America*, and occupies about two fifths of the whole Circumference of the Globe. This we hope, from the natural Curioſity of the *French* (who want no Means of performing it) may be effectually ſupply'd by ſuch of that Nation who may return from *Peru* by the *Eaſt-Indies*.

In the mean time I cannot omit to take Notice of two Particulars, ſeeming to call in Queſtion the Truth of my aforeſaid Map, which I have lately obſerved in the *Memoirs* of the *Royal Academy of Sciences*.

The one is in the *Memoirs* of the Year 1700, concerning the Variation obſerved at *Paraiba* in *Braſil*, about 25 Leagues to the Northwards of *Pernambouc*, by M. *Couplet le fils*, whoſe Words are theſe,

Le 20 *Mai*, 1698. *ayant auparavant tracé ſoigneuſement une ligne* Meridienne, *dont je m'etois ſervi pour les Obſervations Aſtronomiques, j'obſervai la declinaicon de l'aiguille aimantée de* 5° 35′ Nordoueſt. And the ſame Obſerver tells, That he found the Latitude of the Town of *Paraiba* 6° 38′ 18″. Now it ſo fell out, that my ſelf was in the River of *Paraiba*, in the Month of *March*, 1699. and there fitted and cleaned my Ship, ſo that I had full Opportunity to obſerve the Variation both on Board and on Shore, and found it conſtantly to be above 4 Gr. *North-Eaſt*; ſo that I am willing to believe this to be an Error of the Preſs, putting N. W. for N. E; or rather of the Memory of M. *Couplet*, who it ſeems, loſt all his Papers by Shipwreck in his Return. The like may be ſaid of the Latitude of *Paraiba*, which, though I did not obſerve my ſelf, yet at the Fort of *Cabo Dello*, at the Mouth of the River, and which is about 3 Leagues more Northerly than the Town, I found the Latitude not leſs than 6° 55′ South, and by Conſequence that of the Town more than 7 Degrees.

The other is in a Diſcourſe of M. *de Liſle*, in the *Memoirs* of 1710; where he compares the Variations obſerved in ſome late Voyages, with my Map of the Variations. Among other Things, 'tis there ſaid, that on the Eaſt-ſide of the Iſland St. *Thomas*, under the Equinoctial Line, Mr. *Bigot de la Canté*, ſecond Lieutenant of the King's Ship *la Sphere*, had in the beginning of the Year 1708. found the Variation 11½ Gr. whereas my Chart makes it but 5½ Gr. 'Tis true, that I never obſerved my ſelf in thoſe Parts; and 'tis from the Accounts of others, and the Analogy of the whole, that in ſuch Caſes I was forc'd to ſupply what was wanting; and 'tis poſſible that there may be more Variation on that Coaſt than I have allowed. But conſulting my Chart (which was fitted

to

* *Abr.* Vol. II. p. 610. *and* p. 615.

to the Year 1700.) I find I then make the Variation at the Iſle of Saint *Thomas* full 7½ Gr. and not 5½ Gr. the which, by the Year 1708. might well ariſe to near 9 Gr. So that the Difference will become very tolerable; whereas an Error of 6 Degrees, ſuch as is here repreſented, would render the Credit of my Chart juſtly ſuſpected, and the ſame by conſequence wholly uſeleſs, as not to be confided in.

But a further Thing I might complain of is, That in the ſame *Memoire* of M. *de Liſle*, the Geography of my Chart is called in Queſtion; and we are told that I have placed the Entrance of the *Magellan* Straights at leaſt 10 Degrees more Weſterly than I ought to have done: for that the Ship St. *Louis*, in the Year 1708. ſailing from the Mouth of *Rio Gallega*, in about the Latitude of 52 Gr. South, and not far from Cape *Virgin*, directly for Cape *Bonne Eſperance* (which Courſe perhaps was never run before) had found the Diſtance between the two Lands not more than 1350 Leagues, which he concludes, is much leſs than my Chart of the Variation makes it. I know not from what Computation M. *de Liſle* has deduced this Conſequence, but I find by my Chart that I have made the Longitude of *Rio Gallega* 75 Gr. Weſt from *London*, and that of Cape *Bonne Eſperance* 16½ Eaſt from it; that is in all 91½ Gr. difference of Longitude. This, with the two Latitudes, gives the Diſtance, according to the Rhumb-line 1364 Leagues, but according to the Arch of a great Circle, no more than 1287 Leagues; ſo that inſtead of invalidating what I have there laid down, it does abſolutely confirm it, as far as the Authority of one ſingle Ship's Journals can do it.

I do not pretend that I have had Obſervations made with all the Preciſion requiſite, to lay down inconteſtably the *Magellan* Straights in their true Geographical Site; but yet it has not been without good Grounds that I have placed them as I have done. For when Sir *John Narborough*, in the year 1670, wintered in Port St. *Julian*, on the Coaſt of *Patagonia*, Capt. *John Wood*, then his Lieutenant, and an approved Artiſt in Sea Affairs, did obſerve the beginning of an Eclipſe of the Moon, *Sept.* 18. *Stil. vet.* at juſt 8 at Night: And the ſame beginning was obſerved by M. *Hevelius* at *Dantzick* at $14^h\ 22'$; whence Port Saint *Julian* is more Weſterly than *Dantzick* $6^h\ 22'$, or than *London* $5^h\ 6'$, that is 76½ Gr. Beſides, I have had in my Cuſtody a very curious Journal of one Capt. *Strong*, who went into the *South Seas* in queſt of a rich Plate-wreck, and who diſcover'd the two Iſlands he called *Falkland's Iſles*, laying about 120 Leagues to the Eaſtwards of the *Patagon* Coaſt, about the Lat. of 51½. This Capt. *Strong* had a quick Paſſage from the Iſland of *Trinidada* (in 20½ South) to the *Magellan* Straights; and in this Journal, which was very well kept, I found that Cape *Virgin* was, by his Account, 45 Degrees of Longitude more Weſterly than that Iſland, whoſe Longitude I know to be juſt 30 Degrees from *London*: that is in all 75 Gr.

From theſe concurrent Teſtimonies, wanting better, I adventured to fix the Longitude of this Coaſt as I have done; and I can by no means grant an Error of 10 Degrees to be poſſible in it, though perhaps it may need ſome ſmaller Correction. I will however readily grant, that thoſe that go thither from *Europe*, ſhall find the Land more Eaſterly than is here expreſs'd, by reaſon of a conſtant Current ſetting to the Weſtward near the Equator, where Ships are many times long detained by Calms, whilſt the Stream carries them along with it; which thing befalls all Ships bound to any part of the Eaſt Coaſt of the *South America*.

IV. *The Variation of the Magnetical Needle, in the* Atlantick *and Æ*thiopick *Oceans, by Mr.* Joh. Maxwell, *n.* 310. *p.* 2433.

Variation.		Latitude.		Longit. from *London*.		
8°	32′ Weſt.	49°	18′ North.	07°	29′ Weſt.	
6	42	44	31	13	45	
5	30	41	06	15	08	
5	04	40	22	14	54	
4	22	39	11	15	35	
3	30	32	21	15	39	
3	35	32	42	15	38	
1	20	18	50	20	52	
1	14	09	26	17	59	
1	10	00	49	18	42	
1	00	01	09 South.	18	58	
0	16	02	32	19	48	
0	00	03	17	20	05	
0	40 Eaſt.	03	58 South.	20	27	
1	02	05	09	21	39	
1	30	06	21	22	08	
1	50	08	03	23	15	
2	10	09	07	23	35	
3	32	12	03	25	03	
6	04	18	53	26	30	
6	19	19	51	27	02	
6	20	21	26	28	14	
6	30	21	48	28	10	
7	00	21	58	28	23	
6	45	24	45	27	56	
6	36	27	11	27	17	
5	04	33	53	16	58	
0	00	34	21	01	29	30″
1	00 Weſt.	34	15	01	33	Eaſt.
4	16	33	41	06	23	
8	46	34	39	13	02	
11	56	34	30	16	15	*At the Cape*
11	30	32	51	13	41	*of* Good
10	00	30	21	11	46	Hope.

Variation

Variation.		Latitude.		Long. from *London*.	
09	44' Weſt.	29°	51' South.	11°	44'
09	34	29	28	11	31
09	22	28	56	11	05
09	04	27	38	10	01
08	30	26	55	08	45
08	02	25	41	07	22
07	32	24	32	05	43
01	52	16	00	06	30 Weſt *at the Iſle of St.* Helena.

V. *Papers of leſs general Uſe, Omitted.*

n. 276. *p.* 1022. 1. A Letter from Dr. *Wallis* to Sir *Hans Sloane*, with ſome Hints for drawing up an Hiſtorical Account of the Invention and Improvements of the Magnetical Needle.

n. 278. *p.* 1106. 2. A Letter from the ſame to Dr. *Edmund Halley*, expreſſing his entire Approbation of the Doctor's Map of Variations, and recommending the drawing up a Magnetical Hiſtory to him.

n. 335. *p.* 506. 3. Experiments of the Power of the Loadſtone at different Diſtances, by Mr. *Hawksbee*. *This is the Paper mentioned by Dr.* Taylor *in the ſecond Tract.*

n. 339. *p.* 69. 4. A Letter from Dr. *Mather* in *New England*, to Mr. *Waller*, confirming the Account given in No. 157. *Abr.* Vol. II. p. 180. of a Ship Compaſs that had its Poles chang'd in a Thunder Storm.

CHAP. V.

Botany, Agriculture.

I. *Of Manuring Lands by Sea-Shells, as practiſed in* Ireland, *by the Lord Archbiſhop of* Dublin. *n* 314. *p.* 59.

THE Counties of *Londonderry* and *Donnegall* are very mountainous, and thoſe Mountains covered with Bogs and Heath, in ſo much that there is little Arable Ground in them, except what has lately been made ſo. There are three ways practiſ'd to reduce Heath and Bog to Arable Land: The firſt is by cutting of the Scurf of the Ground, making up the Turf ſo cut in heaps, and when the Sun has dryed theſe heaps, they are then ſet on Fire; when burnt as much as they can be, then thoſe heaps are ſcattered on the Ground, and it being plowed, it beareth Barley, Rye, or Oats, for about three Years. The Inconveniences are, that ſuch burning defiles the Air, cauſeth Rain and Wind, is not practical in a wet Summer; and by deſtroying the Sap of the

Earth and Roots of the Graſs, and all other Vegetables, renders it uſeleſs for ſeveral Years after the third, in which it is plowed.

The ſecond way is by Liming; this is much better than the former, becauſe it doth not ſo much Depauperate the Ground, will laſt long, and beareth better Grain, and whatever is pretended, doth not deſtroy the Graſs, if due care be taken not to over Plow it; but then this is very dear, and Lime-ſtone is not every where to be had, and in many Places Fire is wanting.

Marl is not uſed, that I have obſerved in the North, but about the Sea ſide the great Manure is Shells: Towards the Eaſtern part of the Bay of *London*, commonly called *Loughfoyle*, there lies ſeveral Eminencies that hardly appear at Low Water; theſe are made of Shells of Sea-fiſh of all ſorts, more particularly of Perriwinkle, Cockles, Limpet, *&c.* The Country Men come with Boats at Low Water, and carry Loads of theſe Shells away; they leave them in heaps on the Shoar, and there let them lie till they drain and dry, and by that means become much lighter for Carriage; they carry them by Boats as far as the Rivers will allow them, and then in Sacks on Horſes perhaps ſix or ſeven Miles into the Country; they allow ſometimes 40, but moſtly 80 Barrels to an Acre; they agree with boggy, heathy, claiy, wet, or ſtiff Land, but not with ſandy. They ſeem to give the Land a ſort of ferment, as Barm doth to Bread, opening and looſening the Clods, and by that means making way for the Roots to penetrate, and the moiſture to enter into the Fibres of the Roots: The Manure continues ſo long, that I could find none that could determine the time of its enduring. The Reaſon whereof ſeems to be that the Shells melt every Year a little till they be all ſpent, which requires a conſiderable time, whereas Lime, *&c.* operates all in a Manure at once; but it's to be obſerved, that in ſix or ſeven Years the Ground grows ſo mellow, that Corn that grows on it becomes rank and runs out in Straw to ſuch a length, that it can't ſupport it ſelf, and then the Land muſt be ſuffered to lie a Year or two, that the ferment may be a little quieted and the Clods harden, and then it will bear as long again, and for ought I know and could find it, continues to do ſo with the like Intermiſſions for 20 or 30 Years.

In the Years in which the Land is not plowed, it bears a fine Graſs mixed with Daiſies in abundance; and it is pleaſant to ſee a ſteep high Mountain, that a few Years before was all black with Heath, on a ſudden look white with Daiſies and Flowers. It fines the Graſs, but makes it ſhort though thick: Obſerving that this Manure produced Flowers in the Field, I made my Gardener uſe theſe Shells in my Flower Garden, and never ſaw better Carnations, or Flowers fairer or larger than in that cold Climate; and it contributes to deſtroy Weeds, at leaſt doth not produce them ſo much as Dung; it likewiſe produces very good Potatoes at about a Foot diſtance from one another; and this is one Method of reducing boggy barren Land. They lay a little Dung or Straw on the Land, and ſprinkle it with Shells; ſometimes they cut the Potatoes if large, that they may go the farther, and then dig Trenches about ſix or ſeven Foot diſtance, and throw the Earth or Soil they take out of them on the Potatoes, ſo as to cover them, and then fencing the Plot of Ground ſo planted, let them grow. Plant them in *April* or *May*, and they are ripe in *Auguſt*; they dig them as they have occaſion, and let them lie till next Year, then dig them again, and ſo the third Year, every Year they by this means go deeper in the Earth, and at the laſt they dig them, then pick them out as carefully as they can, that little Seed may remain; and the fourth Year they Plow the Ground and ſow Barley, and the Produce is very good for ſome Years; ſome Potatoes will remain and grow up without any hurt to the Barley or Oats, and thoſe they dig and pick out, and the Ground remains good and Arable ever after.

'Tis obſervable, that Shells do beſt in boggy Ground, where the Surface is Turf; Turf generally is nothing but the Product of Vegetables, ſuch as Graſs, Heath, *&c.* that being rotten, the Salt is waſhed away by the Water, and there remains only the earthy, and eſpecially the ſulphureous parts of them, as appears from the Inflammability of Turf; now Shells being chiefly a Salt, it incorporates with the Sulphur of the Plants; and renders them fit for the Vegetation of new Plants. And this appears further from this, that Shells, that have been under the Salt Water, are much better than ſuch as have been in the Earth, or dry at the Strands: Almoſt about the Bay of *Londonderry* if you dig a Foot or two it yields Shells, and whole Banks are made up of them; but theſe, though more intire than ſuch as are brought out of the Shell Iſland, are not ſo profitable for Manure.

I obſerved in a place near *Newtown Lamavady*, about two Miles from the Sea, a Bed of Shells, ſuch as lie on the Strand; the place was cover'd with a Scurf of wet ſpouty Earth about a Foot thick; the Country People uſed the Shells, but they were not reckon'd ſo good as thoſe that are found in the Sea or near it.

Some thouſands of Acres have been improved by the Shells, and that which formerly was not worth a Groat *per* Acre, is now worth four Shillings: They have in many Places thus improved the Mountains that before were very Turf Bogs. In theſe they meet with this Inconveniency, that if the Seaſon for Plowing proves wet, their Horſes ſink ſo deep in the Soil, that they can't Plow it, eſpecially after two or three Years.

They commonly made Lime of the Shells formerly, and ſome do ſo ſtill. I have not, that I remember, ſeen any ſuch Lime, but I underſtood that it bound very well, and I believe it is not ſo corroſive as Lime made of Stone; for I find in the Hiſtory of *Ceylon*, that they make up their Land with Lime of Oyſter-Shells, and which I believe, would be impracticable with common Lime. About thirty Years ago they made Lime of the Shells, and manured their Lands with it; but a poor Country-man, that out of Lazineſs or Poverty had not provided to make Lime, threw the Shells unburnt on his Land; his Crop proved as good as his Neighbours, and the ſecond and third Crop better, and all took the hint, and have uſed them ſo ever ſince. Where Shells are not to be procured, Sea Rack or Sand ſupply the want of them, but are not ſo good; Sea Rack laſts but three Years, and Sand little longer.

'Tis certain *Ireland* has been better inhabited than it is at preſent; Mountains that now are covered with Bogs, have formerly been Plowed: for when you dig five or ſix Foot deep, you diſcover a proper Soil for Vegetables, and find it Plowed into Ridges and Furrows: This is obſervable in the wild Mountains between *Ardmagh* and *Dundalk*, where the Redoubt is built, and likewiſe on the Mountains of *Altmore*: The ſame, as I am informed, has been obſerved in the County of *Londonderry* and *Donegall*; a Plow was found in a very deep Bog in the latter, and a Hedge with Wattles ſtanding, under a Bog that was five or ſix Foot deep above it. I have ſeen the Stump of a large Tree, in a Bog ten Foot deep at *Caſtle-Forbes*; the Trunk had been burnt, and ſome of the Cinders and Aſhes lay ſtill on the Stump. I have ſeen likewiſe large old Oaks grow on Land, that had the Remains of Ridges and Furrows. And I am told, That on the top of an high Mountain in the North, there are yet remaining the Streets and Footſteps of a large Town; and in truth, there are few places, but either viſibly, or when the Bog is removed, there remains marks of the Plow; which ſure muſt prove, that the Country was well inhabited. It's likely that the *Danes* firſt, and then the *Engliſh* deſtroyed the People; and the old Woods ſeem to thoſe that pretend to judge, to be about three or four hundred Years ſtanding, which was near the time that *Courcey* and the *Engliſh* ſubdued the North of *Ireland*, and 'tis likely made havock of the People that remained after the *Danes* were beat out of *Ireland*.

To manure Land by Sea Sand, by Dr. Bury, *n.* 316. *p.* 142.

II. The burning of the Surface is ſo much practic'd in *Devonſhire*, that 'tis elſewhere known by the Name of *Devonſhiring*; but 'tis us'd only for bad Lands by worſe Husbands, for it robs the Ground.

Salt quickens dead Land, and is us'd in the South Weſt part of that Country, which would elſe be the barreneſt, but is now the richeſt part of it. They go as far as the Sea will permit them at the loweſt Ebb, and take the Sand in Bags, and carry it on Horſeback fourteen Miles into the Country and ſpread it upon the Land, and thereby improve it both for Corn and Graſs. In other parts they force their barren Land, by mingling the Earth with Lime, and caſting it on the Ground.

In this they differ, that crude and ſingle Salt, often ſtrew'd on the Ground, does not improve, but corrode it: but Lime, though unmingled, betters it: but in this they agree, that they produce not Graſs fit for the Scythe, but for Paſture, ſhort and ſweet, and growing all the Winter ſo that their Sheep know neither Hay nor Water, nor are their higheſt Grounds parch'd by the Sun in the hotteſt Summer. The Sea Salt is too luſty and active of it ſelf; the Lime has a more balſamick, but gentler Salt; and regularly join'd with the other, is thereby invigorated. How to match theſe two, *Glauber* thus directs. Take Quick Lime, let it ſlack by time without Water; then take Salt and Water, mingle them together, and make them into Balls or Pieces, which you pleaſe, dry 'em as you do Bricks, then burn them for about two Hours. This Compoſt will enrich your pooreſt Land.

Obſervations concerning Vegetation, by Mr. Dela Pryme, *n.* 281. *p.* 1214.

III. Some have made Experiments of Meliorating, Fertilizing and Multiplying of Grain, by ſteeping them in divers Liquors. *Digby* ſomewhere mentions a Plant of Barley, all riſing from one Corn, that by ſteeping and watering with Saltpeter, diſſolv'd in Water, brought forth 249 Stalks, and above 18000 Grains. And the laſt Edition of *Cambden* mentions a thing very obſervable, that the Corn ſown in a Field in *Cornwal*, after a great Battle in the Civil War time, brought forth four or five Ears on every Stalk. I have tryed ſome ſuch like Experiments on ſeveral Grains, as follows.

Upon the 22d of *March*, 1699. I laid to ſteep, A Pea, a Barley Corn, and a Wheat Corn, in Brimſtone Water. A Pea, a Wheat, a Barley and an Oat Corn, in Allom Water. A Pea, a Wheat, a Barley, and an Oat Corn, in an old Diſſol. of Salt of Tartar. A Pea, a Wheat, a Barley, and an Oat, in the *Cap. Mort.* of *Sal Arm.* diſſolved in Urine. A Pea, a Wheat, a Barley, and an Oat, in the diſſolve of the Salt of Walls. A Pea, a Wheat, a Barley, and an Oat, in the diſſol. of Saltpeter. A Pea, a Wheat, a Barley, and an Oat in *Noſtoc* or Star Gelly. A Pea, a Wheat, a Barley and an Oat Corn in Urine.

I ſteep'd them thus five Days and five Nights, and ſet them in a Garden in a good Soil, againſt a North Wall, full in the Sun, on the 27th of the ſame Mouth, after a rainy Night, with a Pea, a Wheat, a Barley and an Oat unſteeped. Upon the 10th of *April* following, I went to ſee them, and found that ſome were juſt come up, ſome not.

The Pea, the Barley and the Wheat ſteep'd in Brimſtone Water all up together. The Pea ſteep'd in Allom Water very big and ſwell'd, but not ſo much as ſprouted, but the Barley, Wheat and Oat above ground. The Pea ſteep'd in the old Solution of Salt of Tartar, was half come up, the Wheat ſcarce ſprouted, but the Barley and Oat quite up. The Pea, the Wheat, the Barley and Oat ſteep'd in the *Caput Mort.* of *Sal Armoniac* diſſolved in Urine, were all up together; as were alſo the next row that were ſteep'd in the Solution of Salt Walls. The Pea and Wheat ſteep'd in the Diſſolution of Saltpeter, were about half up, but the Barley and Oat quite up. Theſe which were ſteep'd in *Noſtoc*, were none of them come up, nor ſcarce ſprouted. The Barley and Oat ſteep'd in Urine were come up, but the Pea and Wheat ſcarce ſprouted. And laſtly, to my great Surprize, the Pea, the Wheat, the Barley and the Oat that were not at all ſteeped, were all of them as ſoon up as any of the former, except only the Wheat, which was about half up. I ſet them all a Finger deep in the Ground, and there was all the time of their growth very fine Weather.

From all which I humbly ſuppoſe that Allom Water is againſt the nature of Peas, and retards their growth, but agrees well enough with Wheat, Barley and Oats. That the Solution of Salt of Tartar is not friendly to the nature either of Peas or Wheat, but agreeable or concordant to the nature of the Oats and Barley. That the Water of Saltpeter had not here any of the great Power or Vertue that I expected, &c. And that theſe ſteepings did not further any of the ſaid Grains in their growth and coming up, but manifeſtly and plainly retarded ſome or moſt of them.

Then I digged all of them up but three ſpires of Barley, which I let ſtand about a Foot and a half, or two Foot, one from another, which grew and encreaſed ſo exceedingly, that they had ſixty, ſixty five, and ſixty ſeven Stalks apiece from their ſingle Grain and Root, with every one an Ear on, and about forty or ſomewhat more Corns apiece in them, which increaſe proceeded perhaps not ſo much from the Grain having been ſteeped in any Liquors, as from the Fertility and Goodneſs of the Soil, and their competent diſtance one from another. I obſerve that new Shoots continually ſtruck up from the Root; and that, as in the *Eaſt* and *Weſt Indies*, there are Trees that always bear Bloſſoms, and Flowers, green and Ripe Fruit at the ſame time, ſo that here if the invigorating heat of the Sun had not been cool'd and weakned by the approach of the Winter Seaſon, there would have continually been new, ripe Corn, and empty Ears on the ſame Root.

Of the Motion of the Sap in Vegetables, by Mr. Rich. Bradley, *n.* 349. *p.* 486.

IV. Plants in general are either *Terreſtrial*, *Amphibious* or *Aquatick*: and ſo nearly do Vegetables agree with Animals in moſt Points, except local Motion and its Conſequences, that from the Knowledge of the one we are reaſonably led to the Diſcovery of the other.

Thoſe Plants I call *Terreſtrial* are Trees, Shrubs, and Herbs, which grow only on the Land. Theſe like Land Animals have Diverſities of Food, a Method of generating, and certain Periods of Life.

Of the *Amphibious* Race, which live as well on Land as Water are the Willows, Ruſhes, Minths, &c. theſe are not much unlike in many reſpects to the *Otter*, *Tortoiſe*, *Frog*, &c.

The *Aquaticks*, whether of Lakes, Rivers or Seas are very numerous; theſe may be compar'd with the Fiſh kind, and like them will not live out of their proper Element. In *freſh Waters* are the *Water-Lilly's*, *Plantains*, &c. and in the *Sea*, *Corals*, *Fuci*, &c.

Plants ſeem to poſſeſs only the next degree of Life below the moſt ſtupid *Animal*; or where Animal Life leaves off, the Vegetable Life ſeems to begin. The Seaſons of Motion in *Plants* are the ſame with thoſe of *Animals*, which ſleep during the Winter. An Artificial Heat will give Motion to either of theſe in the coldeſt time.

The common Opinions relating to the *Saps* Motion are as follows. Firſt, The *Sap* does not riſe by the *Pith*; becauſe ſome have obſerv'd the Trunks of large Trees to be without that part, and yet the ſame Trees have continued to put forth Fruit, and Branches on their Tops. I have obſerv'd, that the *Pith* is not found in thoſe Branches of a Tree which exceed two or three Years growth; and it is certain, that the *Pith* which is in a Branch of this Year, will (the greateſt part of it) be diſtributed into thoſe Boughs which form themſelves the next Seaſon.

It is ſaid by ſome, that the Tree does not receive its Nouriſhment by the *Bark*, for that Trees having loſt that part, will ſtill continue their Growth. Others tell us, That if the *Bark* be cut away round the Trunk of a Tree, it will preſently die. Theſe various Opinions ſeem to have been ſet on Foot without extraordinary Conſideration, upon the belief that a Tree has but one *Bark*: Whereas, upon Examination with the Microſcope, we find four diſtinct Coverings to each Branch, without the woody parts. The two outermoſt *Barks* may be taken from a Tree without great Damage, but the other two which lye nearer the Wood being ſtrip'd off will kill the Tree.

Some affirm, That the *Sap* doth neither riſe nor fall in the woody part of a Tree, becauſe they have not been able to diſcern any *Sap* to iſſue out of that part, when a Branch has been cut. The Microſcope plainly ſhews us the Veſſels in the Wood, through which the *Sap* riſeth from the Root; but as theſe Tubes are not large enough to admit into them any thing more groſs than Vapour, ſo they have not been eſteem'd to be of any great Uſe. But I hope the Explanation of the adjoyn'd Figure will in ſome meaſure diſcover the Office of theſe, and of ſuch other parts of a *Plant* as are ſeverally deſign'd for the Growth of Vegetables; but it will firſt be convenient to enquire a little into the Nature of the *Root*.

The *Root* of a Tree is chiefly compoſed of a *Parenchyma*, more groſs than that in the Stem or Body of the Tree; it has likewiſe Veſſels and a Covering, which I ſhall better explain in another Paper. The Root, that is, the principal part of it, receives into it ſuch Juices of the Earth as are proper for it, and no other. Somewhat like a Weck of Cotton, which having been impregnated with Oil, will only admit Oil into it. This Proviſion being made in the *Stomach* of the *Plant* (as I call it) chiefly in the Autumn Months, the Tree is prepared for Germination ſo ſoon as the Earth is ſufficiently warm'd, either by the Sun's Beams, or an artificial Heat, ſuch as Horſe-Dung, Bran and Water, or other ſuch like Ferments. Theſe Heats raiſe into Vapour the Juices contained in the Root, and by that means cauſe Vegetation.

Plate 10. *Fig.* 1. *Figure* 1. Is part of the Branch of an *Apple Tree*, made in *May* 1715, and cut in *April* 1716. It was cut in Figure of a half Cylinder, the length ſomewhat more than the Diameter, which was about a quarter of an Inch. This being magnified with one of *Campani*'s Microſcopes, diſcovers the following parts, *viz.*

te X. Part III. P. 293.

Fig. 1.

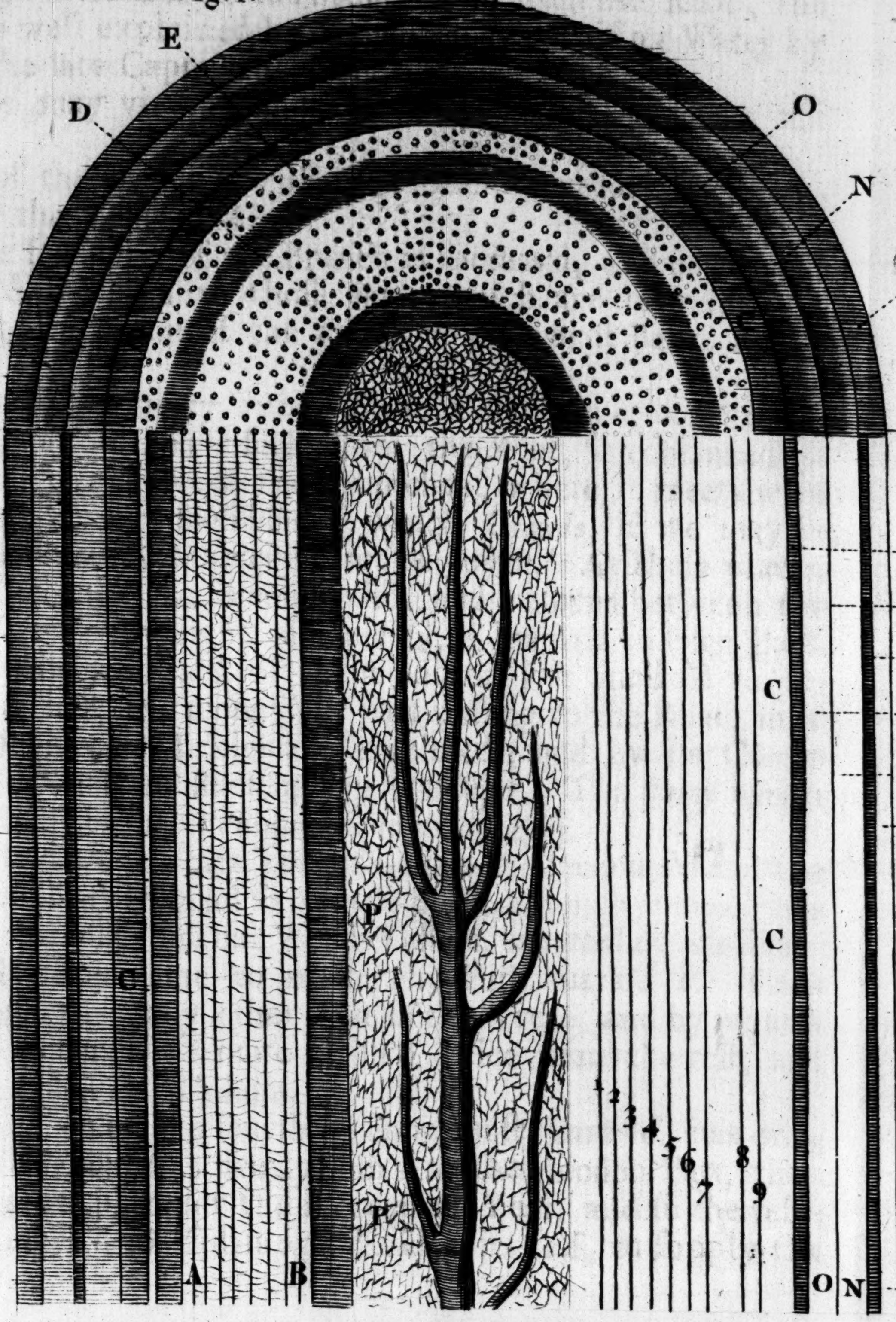

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Fig. 6.

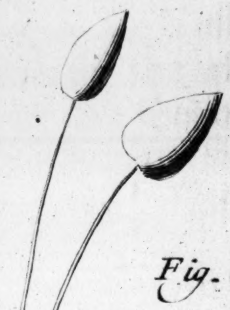


Fig. 8.

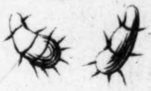
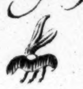


Fig. 9.



g. 7.

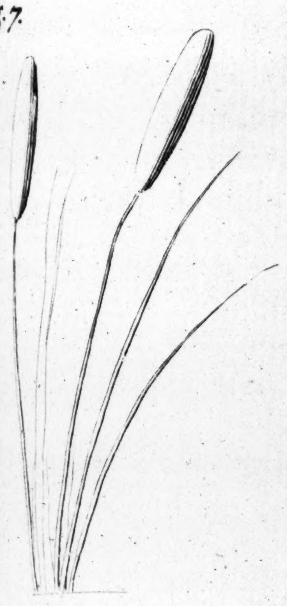


Fig. 2.

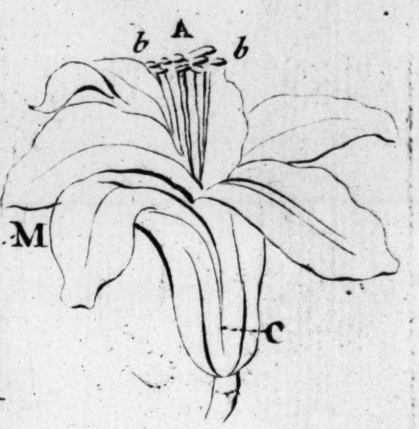


Fig. 3.

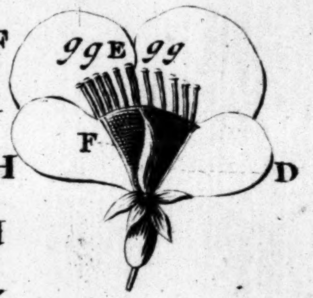


Fig. 5.

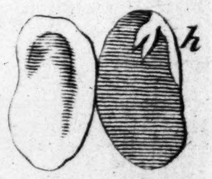
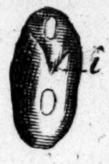


Fig. 4.



1, 2, 3, 4, 5, 6, 7. are Capillary Veſſels, which run longitudinally through the Branch, in the Ligneous part, which was made in the Year 1715. Through theſe Tubes, the Steam riſeth from the Root; the ſtrength of which is well explained by the Engine for raiſing Water by Fire, invented by the late Captain *Savory*.

From *A* to *B*, we may view Veſſels of the ſame ſort, made at the ſame time.

8, 9. are Veſſels of the ſame uſe with the former, now forming themſelves for the uſe of the Year 1716.

By this means the Diameter of the Branch is increas'd, and additional Nouriſhment ſuffer'd to paſs into thoſe Buds which are to make new Branches. Theſe are made out of the fourth or innermoſt Bark, markt C, C.

The Mouths of the Capillary Tubes of the Years 1715, and 1716. are *D*, *E*. The Vapour which riſeth from the Root, is continued in theſe Veſſels, to the Extremities of the Branches; where it meets with parts (not here deſcrib'd) like to *Glands*; which *Glands*, if we may ſo call them, are likewiſe found at every Knot or Joynt. At theſe places, the Vapour coming near the Air is condenſed, and returns between the Barks, by means of its own weight, down *F*,*G*,*H*, leaving in each Bark mark'd *I*,*K*,*L*, ſuch Juices as each of them naturally is inclin'd to ſeparate from it; till at laſt, the more Oily part paſſing to the Root, may lengthen the *Fibres* thereof, as Icicles are lengthned; and by its Oleous Particles, preſerve them from Rotting by the Wet. The parts which compoſed the ſeveral Barks, are *Parenchymous* or *Spongey*.

The firſt mark'd *M*. is of a cloſer Texture than the ſecond *N*. and the ſecond cloſer than the third *O*, and ſo on till theſe Parenchymous Parts are interwoven with the longitudinal Wood-Veſſels, where they are ſomewhat conſtrain'd, till they come to make the Pith mark'd *P*. Then they are much larger than in any other part of the Tree; and by what I have obſerv'd, ſeem to contain a more finiſh'd Juice than the reſt, and may well enough be ſtiled the *Medulla*.

We may note, that when the fourth or innermoſt Bark *C*, has once compleated its Sap Veſſels, and is firmly join'd to the wooden Part, then the third Bark *O* takes its place for the ſucceeding Year, and ſo the reſt; except that the firſt mark'd *M*, ſplits and divides its ſelf, to ſupply the place of the ſecond.

Obſervations on the Parts and Uſe of the Flower in Plants, by Mr. Sam Morland *n.* 287. *p.* 1474.

V. Dr. *Grew* has obſerv'd, that the *Farina* (or fine Powder, which is at its proper Seaſon ſhed out of thoſe *Thecæ* or *Apices Seminiformes*, which grow at the top of the *Stamina*) doth ſome way perform the Office of Male Sperm. But herein I think he falls ſhort, in that he ſuppoſes them only to drop upon the outſide or the *Uterus* or *Vaſculum Seminale*, and to impregnate the included Seed by ſome ſpirituous emanations or energetical impreſs.

That which is now in queſtion is, Whether it be not more proper to ſuppoſe that the Seeds which come up in their proper *Involucra*, are at firſt like unimpregnated *Ova* of Animals; that this *Farina* is a *Congeries* of Seminal Plants, one of which muſt be conveyed into every *Ovum* before it can become prolifick; that the *Stylus* in Mr. *Ray*'s Language, the upper part of the *Piſtillum* in Mr. *Tournefort*'s, is a Tube deſigned to convey theſe ſeminal Plants into their Neſt in the *Ova*; that there is ſo vaſt a Proviſion made, becauſe of the odds there are, whether one of ſo many ſhall ever find its way into, and through ſo narrow a Conveyance. To make this Suppoſition the more credible, I ſhall lay down the Obſervations I have made upon the Situation of theſe *Stamina* and the *Stylus* in ſome few ſpecies of Plants. Firſt, in the *Corona Imperialis*, where the *Uterus* or *Vaſculum ſeminale* of the Plant ſtands upon the Center of the Flower, and from the top of this ariſeth the *Stylus*, the *Vaſculum Seminale* and *Stylus* together repreſenting a *Piſtillum*. Round this are planted ſix *Stamina*, upon the ends of each of theſe are *Apices* ſo artfully fixt that they turn every way with the leaſt Wind, being in height almoſt exactly equal to the *Stylus* about which they play, and which in this Plant is manifeſtly open at the top, as it is hollow all the way. To which we muſt add, That upon the top of the *Stylus* there is a ſort of *Tuft*, conſiſting of pinguid *Villi*, which I imagine to be plac'd there, to catch and detain the *Farina* as it flyes out of its *Theca*. From hence I ſuppoſe the Rain either waſhes it, or the Wind ſhakes it down the Tube, till it reach the *Vaſculum Seminale*. In *Caprifolium*, or *Honey-ſuckle*, there riſes a *Stylus* from the Rudiments of a Berry, into which it is inſerted to the top of the *Monopetalous* Flower, from the middle of which Flower are ſent forth ſeveral *Stamina*, that ſhed their *Farina* out of the Caſes upon the Orifice of the *Stylus*, which in this Plant is villous or tufted, upon the ſame Account as in the former. In *Allium* or *common Garlick*, there ariſes a *Tricoccous Uterus*, or Seed Veſſel, in the Center of which is inſerted a ſhort *Stylus*, not reaching ſo high as the *Apices*, which thus over topping it, have the Opportunity of ſhedding their Globules into its Orifice more eaſily. For which reaſon I can diſcern no Tuft upon this (as in the former) to inſure their Entrance, that being provided for by its Situation juſt under them.

I will offer now ſome ſuch Reaſonings or Reflections as the foregoing account doth ſuggeſt, and will ſupport. Nothing can be more natural than to conclude, that where a fine *Powder* is curiouſly prepared, carefully repoſited, and ſhed abroad at a peculiar Seaſon; where there is a Tube ſo planted as to be fit to receive it, and ſuch care in diſpoſing this Tube, that where it doth not lye directly under the Caſes that ſhed the Powder, it hath a particular *Apparatus* at the end to inſure its Entrance. Noting can be more genuinely deduc'd from any Premiſes than from this it may, that this *Powder* or ſome of it was deſigned to enter this Tube. If theſe *Stamina* had been only excretory Ducts, as has been hitherto ſuppos'd, to ſeparate the groſſer parts, and leave the Juice deſign'd for the Nouriſhment of the Seed more reſerv'd, what need was there to lodge theſe Excrements in ſuch curious Repoſitories. They would have been convey'd any whither, rather than where there was ſo much danger of their dropping into the *Seed Veſſel* again, as they are here. Again, the *Tube*, over the Mouth of which they are ſhed, and into which they enter, leads always directly into the *Seed Veſſel*. To which we muſt add, That the *Tube* always begins to dye when theſe *Thecæ* are empty'd of their Contents; if they laſt any longer, it is only whilſt the *Globules* which enter at their Orifice, may be ſuppos'd to have finiſh'd their Paſſage. Now can we well expect a more convincing Proof of theſe *Tubes* being deſigned to convey theſe *Globules*, than that they wither when there are not more *Globules* to convey.

If I could now ſhow that the *Ova*, or unimpregnated Seed, are ever to be obſerved without this *Seminal Plant*, the Proof would ariſe to a Demonſtration; but I have not been ſo happy as to diſcern this. Tho' in the mean time, I have made ſome Steps towards a Proof this ſort, and have met with ſome ſuch Hints as make me not deſpair of being able, in a ſhort time, to give the World even this Satisfaction. For, not to inſiſt upon this, that the *Seminal Plant* always lies in that part of the Seed which is neareſt to the Inſertion of this *Stylus*, or ſome Propagation of it into the *Seed Veſſel*; I have diſcovered in *Beans* and *Peas*, and *Phaſeoli*, juſt under one end of that we call the *Eye*, a manifeſt Perforation (diſcernible by the groſſer ſort of magnifying Glaſſes) which leads directly to the *Seminal Plant*, and at which I ſuppoſe the *Seminal Plant* did enter; and I am apt to think that the Beans or Peas which don't thrive, will be found deſtitute of it.

But I muſt now proceed to deſcribe ſome other Plants, whereby it will appear, that there is a particular care always exercis'd to convey this Powder, ſo often mentioned, into a *Tube*, which may convey it to the *Ova*. Now in *Leguminoſe* Plants, if we carefully take off the *Petala* of the Flower, we ſhall diſcover the *Pod* or *Siliqua* cloſely cover'd with an involving Membrane, which about the top ſeparates into many *Stamina*, each fraught with its quantity of *Farina*, and theſe *Stamina* are cloſe bound upon the *Bruſh*, which is obſervable at the end of that *Tube*, which here alſo leads directly to the *Pod*; it ſtands not upright indeed, but ſo bended as to make near a right Angle with it.

In *Roſes* there ſtands a *Column*, conſiſting of many *Tubes* cloſely clung together, though eaſily ſeparable, each leading to their particular Cell, the *Stamina* in a great number planted all round about. In *Tithymalus*, or *Spurge*, there riſes a *Tricoccus* Veſſel, that whilſt it is ſmall and not eaſily diſcernible, lyes at the bottom till 'tis impregnated, but afterwards grows up, and ſtands ſo high upon a tall *Pedicle* of its own, as would tempt one to think that there were to be no Communion betwixt this and the *Apices*, which he ſees dying below. In *Straw-berries* and *Raſ-berries*, the Hairs which grow upon the ripe Fruit (which I ſuppoſe may be ſurprizing to ſome) are ſo many *Tubes* leading each to their particular Seed, and therefore we may obſerve, that in the firſt opening of the Flower there ſtands a Ring of *Stamina* within the *Petala*, and the whole inward *Area* appears like a little Wood of theſe Hairs or Pulp, which when they have received and convey'd their *Globules*, the Seeds ſwell and riſe in a carneous Pulp.

I ſhall content my ſelf with ſuggeſting, that hence one would conclude that the *Petala* of the Flower were rather deſign'd to ſever ſuperfluous Juices from what was left to aſcend in the *Stamina*, than the *Stamina* to perform this Office, either for them, or the unimpregnated *Semina*. And obſerve the Analogy between *Animal* and *Vegetable* Generation, as far as was neceſſary there ſhould be an Agreement between them.

The Explication of the Figures. Plate 10.

Fig. II. Repreſents a yellow Lilly. *A* the top of the *Piſtillum* or Tube, at which the Seminal Plants are ſuppos'd to enter, and through which they are convey'd to the unimpregnated Seed in the Seed Veſſel. b b b b b b. the *Apices Seminiformes*, which, when they are ripe, open, and ſhed that Powder which enters the Tube at A. C. The place of the Seed Veſſel at the bottom of the Tube, the Seed Veſſel it ſelf being concealed under the Leaf in this Draught.

Fig. III. D. The *Siliqua* in a Flower of the Peakind. E. The Tube which ariſes from the *Siliqua*, and conveys the Plants to it. F. The Membranous Coat that involves the *Siliqua* laid open. g g g g g g. The *Apices*, which, before the Membranous Tegument is laid open, appear to riſe from its edges, and by the *Petala* of the Flower are kept cloſe upon the Orifice of the Tube, that they may conveniently ſhed their *Farina* into it.

Fig. IV. A *French* Bean repreſented ſidewiſe.

Fig. V. The ſame open'd. h. the Seminal Plant. i. A Perforation, at which 'tis ſuppos'd the Seminal Plant firſt enter'd.

The Husbandry of Canary Seed by Mr. Edw. Teniſon, *n.* 337. *p.* 91

VI. To prepare Land for this Seed, let it be broke up ſome time in *April*, and plough'd again about *Midſummer*, and plough'd again in *Auguſt*, that by frequent Tillage the Weeds may be burnt up and deſtroy'd. Plough the laſt time about the latter end of *February*, or the beginning of *March*, if the Seaſon proves dry; if not, you had beſt wait for a dry Seaſon; for in ſuch a Seaſon only will the Ground be fit to receive the Seed. With a Hoe, (that has a Bit about the bigneſs of an Onion-Hoe,) you muſt from time to time carefully cut up the Weeds. If they are not kept entirely under, much of the Seed will be loſt for want of ripening. In very good Land half a Buſhel of Seed will be enough to ſow an Acre. It will thrive beſt upon a ſtiff Clay; it will grow upon any ſort of loamy Land, that is rich enough to bear Hemp. If you apprehend that the Land is not ſufficiently ſtrong, you will do well to allow from half a Buſhel to ſeven Gallons of Seed to ſow an Acre with. The Seed is ripe ſooner or later, according as the

Spring affords you an early or late Seaſon of ſowing it. In ſome Summers 'tis cut in *Auguſt*, but the moſt uſual time is after Wheat-Harveſt. When it is cut, it muſt in moſt Years lie 5 or 6 Days in ſwarth, and then be turn'd, and lie till one ſide is dry'd and rotted as much as the other, which may be about 4 or 5 Days longer. The certain number of Days can't be fix'd, becauſe they muſt be more or leſs, according as the Weather proves fair or rainy.

The reaſon of its lying ſo long in ſwarth is, That the lower Heads of the Seed (being expoſed to the Air Wind and Sun) may the better perfect their ripeneſs, and the Graſs and Weeds that ſprung up with the Stalks be thoroughly wither'd, and the Ears or Heads well and ſufficiently rotted, that the Seed upon threſhing may come out clean. The Produce upon Land that is very good, is about ſix Quarters per Acre. If the Land be but indifferent, or if the Weeds be not kept under, then from four to five Quarters upon an Acre is as much as you can expect. The Price of Seed is from two Pounds to ſix Pounds per Quarter; but the moſt uſual Price is from Forty Shillings to Three Pounds.

It is difficult to Threſh. So much of the Seed, as after threſhing, is beaten out (as ſoon as 'tis fann'd) is to be run through a Wire Sieve (ſuch as is uſed to ſeparate Cockle from Corn) and the Husks of every ſifting, that will not paſs through the Sieve, are to be thrown by in a heap to be threſh'd over again. The ordinary Price for threſhing is Five Shillings, but in ſome Years the Threſher has Six Shillings per Quarter.

Inſtances of the very great and ſpeedy Vegetation of Turnips, *Communicated by Dr.* J. Deſaguliers, *n.* 360. *p.* 974.

VII. At *Sutton Coldfield* in *Warwickſhire*, a peaty Ground near a Pool (of which it was formerly a part) was ſown with *Turnip Seed* on the ſecond Day of *July* 1702. In leſs than three Days Time the Turnips were ſeen above Ground. At three Weeks end the Roots were in Bigneſs equal to Walnuts. Within leſs than five Weeks after the Sowing, the Gardner drew great Quantities of Turnips to ſell, they then being as big as large Apples. At the end of Six Weeks, *viz.* on the 12th Day of *Auguſt*, a large Turnip was plucked up (though probably not ſo big as ſeveral others then growing upon the ſame Ground) which, together with its top and long deſcending part of the Root, weighed above two Pounds and fourteen Ounces. At the ſame time alſo was weighed an Ounce of the ſame ſort of Turnip Seed, that the Gardener had ſown his Ground with; and afterwards a Thouſand of the Grains were counted ſingly out of the Ounce ſo weighed; and the reſt of the Ounce was divided into Heaps, as near as could be gueſſed, equal to the 1000 Seeds firſt ſevered and laid together: And it was found that the whole Ounce contain'd above 14600 ſingle Grains; which number multiplied by 46 (*viz.* the number of Ounces that the Turnip weighed) produceth 671,600, *viz.* the number of ſingle Grains of Seed required to equal the Weight of the Turnip. From whence may be gathered, that (upon Suppoſition, that the Increaſe of the Turnip was all along uniform and equal, from the time it was ſown till it was pluck'd up) the Grain of Seed which it ſprung from, weighing when it was ſown but $\frac{1}{14600}$ of an Ounce, was increaſed in Weight according to the following Proportions, *viz.*

	In Six Weeks time	671,600	times its own Weight.
Every	Week	$111,933\frac{1}{3}$	
	Day	$15,990\frac{1}{2}$	
	Hour	$666\frac{1}{4}$	
	Minute of an Hour	11	

Some time after, another Ounce of the ſame ſort of Seed was exactly weighed, and the Grains were found to be in Number 14673.

Another Turnip of the ſame Crop was plucked up on the 21ſt Day of *October*; and being put into a Scale, was found to weigh above ten Pounds and an half; which unuſual and truly wonderful Bulk it acquired (it being ſuppoſed, as above, that the Growth was all along alike) by increaſing the weight of the Seed it was raiſed from, 15 times in every Minute of an Hour from the ſowing to the drawing of it. The Gardener neglected to thin his Turnips in due time, elſe probably their Growth had been more conſiderable.

At another Time, in two other ſorts of Turnip-Seed, it was found by counting, that an Ounce of one ſort contained 14702 Grains; and an Ounce of the other ſort no fewer than 14905 Grains. It's credibly reported, That of late Years, Turnips have been pretty frequently found growing in ſeveral Counties of this Kingdom, that have weighed above twice as much; one of which was ſeen at *Birmingham* about the Year 1710.

Of the Mouldineſs in a Melon, by Mr. Rich. Bradley, *n.* 349. *p.* 492.

VIII. I had lately a large Melon Fruit, which I ſplit lengthways thro' the middle, in order to obſerve the Veſſels which compoſ'd the Membrane or Tunick of each Ovary; but my Affairs not permitting me to go on, I laid by the one half to be examin'd at more leiſure. At the end of four Days, I found ſeveral Spots of Mouldineſs began to appear on the fleſhy part of the Fruit, ſomewhat green towards the Rind; and of a paler Colour towards the middle of the Fruit. Theſe Spots grew larger every Hour, for the ſpace of five Days; at which time the whole Fruit was quite cover'd. This ſurprizing Vegetation made me curious to examine, if there was any difference between thoſe parts which were green and the others, beſides their Colour. The firſt being ſeen with the Microſcope, appear'd to be a *Fungus*, (ſee *Fig.* 6.) whoſe Cap was filled with little Seeds, to the number of about five hundred; which ſhed themſelves in two Minutes after they had been in the Glaſſes. The other ſort had many Graſs-like Leaves, among which appear'd ſome Stalks with Fruit on their top. Each Plant might well enough be compared to a ſort of *Bull Ruſh*, (*Fig.* 7.) They had their Seed in great

Plate 10.

Quantities, which I believe were not longer than three Hours before they began to Vegetate; and it was about ſix Hours more, before the Plants were wholly perfected: for, about ſeven of the Clock one Morning, I found three Plants at ſome diſtance from any others; and about four the ſame Day, I could diſcern above five hundred more growing in a Cluſter with them, which I ſuppoſed were Seedling-Plants of that Day. The Seed of all theſe were then ripe and falling.

When the whole Fruit had been thus cover'd with Mould for ſix Days, this Vegetable Quality began to abate, and was entirely gone in two Days more. Then was the Fruit putrified, and its fleſhy parts now yielded no more than a ſtinking Water, which began to have a gentle Motion on its Surface, that continued for two Days without any other Appearance. I found then ſeveral ſmall Maggots (*Fig.* 7.) to move in it, which grew for the ſpace of ſix Days; after which they laid themſelves up in their Bags. Thus they remain'd for two Days more without Motion, and then came forth in the ſhape of Flies. (*Fig.* 8.) The Water at that time was all gone, and there remain'd no more of the Fruit than the Seeds, the Veſſels which compoſed the Tunicks of the Ovarys, the outward Rind, and the Excrement of the Maggots; all which together weigh'd about an Ounce. So that there was loſt of the firſt weight of the Fruit when it was cut, above twenty Ounces. We may judge from this, and other Caſes of the like nature, how much Vegetable Life is dependent on Fermentation, and animal Life on Putrifaction.

Obſervations on the Planting and Culture of Tobacco in Zeylan, *by Mr.* Strachan, *n 279 p.* 1164.

IX. There are two ſorts of Tobacco, which both they call *Dunkol*, the Signification is a ſmoaking Leaf, for *Dun* is Smoak, *kol* a Leaf, the one they call *Hingele Dunkol* or *Singele Dunkol*, for they make no Diſtinction of *H* and *S*; the other is called *Dunkol Kapada*, which Word *Kapada* ſignifies gelding, and is derived from the *Portugueſe*; which Tobacco is very intoxicating, and much ſtronger than the former, it is the ſame Plant, the difference is only that *Singeleſe* Tobacco has little attendance, upon the other a great deal of pains is taken until it be fit for uſe, and it is done thus: They clear a little piece of Ground, in which they ſow the Seed of Tobacco, as the Gardiners here ſow Parſly and Coleworts; againſt the time that this is ready for tranſplanting, they chooſe a piece of Ground, which they hedge about; when the Buffelo's begin to chew the Cud, they are put within this Hedge Ground, and let ſtand until they have done, and this they continue Day and Night, until the Ground be ſufficiently dunged; then the Ground is tilled with a Spade, in form of a Pick-axe ſuch as Carpenters uſe when they ſmooth Planks, by howeing the Ground, and turning the ſame, and mixing the Dung among the Earth; when they have made the Ground ſmooth, they remove the Plants out of the Bed wherein they were ſown, and ſet them in this Ground, about a Foot diſtance one from another, and then they grow up almoſt like a Dock; when the

Stem has got 15 Leaves, they cut off all the tops of the Plants; if they deſire not to have the Tobacco to be very ſtrong, they let it grow until it have 18 or 20, if they will have it ſtronger, they top it when it has got 10 or 12 Leaves, not counting the 3 or 4 loweſt Leaves, which are neareſt the Ground, becauſe they never grow ſo big and good as thoſe above them. Thus the moiſture of the Ground being hindred to waſte in more Leaves, Flowers and Seed, all the ſaid moiſture enters into the Leaves remaining, ſo that theſe Leaves will be 4 or 5 times larger, fuller of fatneſs, ſtrength and vertue, than the Tobacco which is not ordered after this manner. Now the moiſture aſcending from the Root, being conſtrained within the Bounds of theſe Leaves, forces his way betwixt the Stem and Leaves remaining, and ſends forth young Sprouts, and would grow forth in Branches, if no care were taken to hinder. Therefore every 3 or 4 Days they go through all the Stems, and break off theſe Buds whenever they ſpring forth, and this they continue until theſe Leaves be ripe (which takes as much time as the *Singele* Tobacco does, which gets Flowers and ripe Seed, and then begins to wither and ſpoil, if no uſe be made of it) which is known by the thickneſs and firmneſs.

Then before the Leaf begins to wither and is green, they cut down the Stem together with the Leaves; and do bring them into their Houſes, and lay them in a heap, and thus the Leaves will begin to ferment, turn hot and ſweat; then when the Leaves begin to ſweat, they turn the innermoſt outmoſt, that they may eaſily ferment, otherwiſe the innermoſt would ferment too much, ſpoil and rot; thus the longer they lye in a heap together, the Tobacco turns the more dark of colour. When they think it has ſweat enough, they hang it aſunder upon Cords, until the Leaves be dry, then they ſeparate the Leaves from the Stalks, and lay them up in Bundles together until they have uſe for them.

Now the other Tobacco, called *Singele Dunkol*, is only ſown and then planted, and has liberty to grow, to ſhoot out Flower and Seed, thus all ripen together, then it is cut down and caſt together in a heap; ſome will ferment too much and rot, others will ferment not at all, and will remain green, although it be dry, and will have a ſmell of Hay or dry Graſs. The Souldiers, who delight to ſmoak a big Pipe full, and that frequently in one Day, do ſmoak this common ſort; ſome will mix ſome of the *Kapada* among it; the *Cingualeſes*, who ſmoak not ſo much at once, neither ſo frequently, do take a piece of the *Kapada* and roll it together, then roll a piece of dry Leaf of the *Wattukan* Trees about this, and kindle it at one end and ſuck at the other, until it be conſumed. Some do chew it among Betle, taking but very little at once.

A Seed in Ceylon, *of great Virtue againſt the Stone, by* Dr Hotton, *n.* 268. *p.* 760

X. Attmella, Acemella, & Hacmella, iſtis enim nominibus miſſa mihi Anno 1691. ſemina ex inſula Ceylon, ubi naſcitur & familiaris eſt. Ipſa planta, quam colui Anno 1692. flores fert in caulium ſum-

mis ex multis Floſculis tubuloſis coagmentatos, in caput coactos, & Perianthio Hexaphyllo aut Polyphyllo ſuffultos, perquam ſimiles Chryſanthemo Curaſſaviro, alato caule, Flore aurantio, ſed luteolos; quibus excuſſis ſequuntur ſemina ex fuſco gryſea, longa, plana, ſumma ſui parte duplici ariſta prædita, ipſis floſculis ſubjecta; caules edit quadratos, Foliis conjugatis Lamii aut Urticæ longioribus & acriuſculis veſtitos, ex quibus conjicitur ſpectare hanc plantam indubie ad Corymboſarum gentem & genuinam eſſe ſobolem ejus generis, quod Bidens a ſemine bidente vocat Cæſalpinus eumque ſecutus Tournefortius. Quare cum hactenus nomine careat hæc planta, hoc ex ipſius plantæ ingenio ei imponendum cenſeo.

Bidens Urticæ folio Lithontriptica Zeylanica. Inter omnia enim Medicamenta quæ in comminuendo calculo valere perhibentur, planta hæc nuperis annis facta eſt celeberrima. Miles quidam, qui primus Anno 1690. Societati noſtræ Indicæ indicium hujus herbæ dedit, profitebatur ſe pluſquam centum ægros ejus ope liberaſſe a calculo & Nephriticis doloribus: quam & cum ſucceſſu uſurpatam in duobus ægris calculoſis teſtantur in literis eodem anno ad Societatem Indicam datis Gubernator & Supremus Batavorum Conſeſſus in inſula Ceylon, aiunt enim in iis deturbatas expulſaſque fuiſſe multas arenulas, minutoſque calculos abſque ullo fere dolore.

Primus Noſocomii urbis Colombo, quæ ſita eſt in memorata inſula, Chirurgus, Vir, ut videtur induſtrius plane & diligens, in literis Anno 1699. ad me datis, in rei veritate teſtari ſe poſſe aſſerit, efficacius medicamentum contra calculum & Nephriticos dolores repertum hactenus non fuiſſe, qui & porro addit tres ejus ſpecies a ſe multa inveſtigatione inventas quarum prima foliis amicitur dilute virentibus & ſemen producit itidem luteum: Secunda folia edit ſature virentia & ſemen producit itidem luteum: Tertia ſemen nigrum profert & longe majoribus foliis veſtitur quam reliquæ duæ, quas virtute præſtantiſſimas eſſe aſſerit, denique ſubjungit fertiliſſimam eſſe hanc plantam, quæque pluſquam decem millia ſeminum gignit. Hujus uſurpantur folia, ſemen, quod præ cæteris partibus laudat præfectus ille noſter Noſocomii Zeylanenſis, Radix, caules & rami. Folia lecta antequam flores prodeunt, in umbra ſiccata, & in pulverem comminuta dantur in convenienti vehiculo aut aquæ calidæ infunduntur, bibiturque ea infuſio inſtar infuſionis herbæ The. Infunduntur & Spir. vini & paratur per diſtillationem Spiritus ex Radice, caulibus & ramis. Flores, Radices, extractum, & Sal in Pleuritide Colica & Febribus feliciter ſe uſurpaſſe teſtatur alius quidam Noſocomii Zeylonenſis præfectus.

Atque hæc ſunt, quæ mihi innotuere ex litteris Colombo ad Societatem noſtram Indicam & ad me datis.

XI. The firſt that brought it into reputation was a *Portugueze* Surgeon, who having lived many Years in *Brazil*, diſcovered the Virtues of this Plant; after returning into *Portugal* with a deſign to raiſe a great Trade with it, he ſent ſeveral *Specimens* of it every where. He called the Plant *Iquetaia*, and attributed to it no leſs Virtues than the cure of

A new Plant from Braſil, by Monſ. Marchand. n. 278. p. 1103.

Apoplexies, *Pleuriſies* and *Intermitting Fevers*. He added one thing, which though more particular, yet ſeemed more probable, which was, that the Leaves, infuſ'd with *Senna*, took from it its diſagreeable taſte and ſmell without altering any thing of its *Purgative* quality. The *Samples* that he ſent were not in ſufficient quantity to make Experiment on the Diſtempers, he ſaid, it was proper for; but there was enough to try whether they had the virtue to correct the taſte and ſmell of *Senna*. Therefore there was infuſ'd two *Drams* of it with as much *Senna* in a *Chopine* of Water, and the Experiment confirmed the matter of Fact. Being deſirous to know what *Species* of Plant it was, and it being impoſſible to diſcover it by the Leaves, the *Portugueze* Surgeon had taken ſo much care to cut them very ſmall, Monſieur *Homberg*, who had ſome of it ſent him, perceived ſome Seeds ſwimming on the Water, in which they were infuſ'd, and taking up as many as he could of theſe Seeds, gave them to Monſieur *Marchand*; who ſowed them, from whence grew up a Plant, which (God be thanked) we need not go to *Brazil* to ſeek, it grows in *Europe*, nor need we go out of *France* to find it; nay more, we may have it all round *Paris*; 'tis the *Scrophularia aquatica*. To be the more certain of it, there was ſome of our *Scrophularia* ſowed on a Bed, and ſome of the other Seed on another, and there was obſerved but ſome ſmall Differences, which may be well attributed to the different Culture and Soil. There was likewiſe tryed the Vertue of our *Scrophularia*, and it was found to have the ſame Effect, in taking away the Taſte and Smell of *Senna*.

Of the Root of Pareira Brava, *by Dr.* Helvetius, *n.* 346. *p.* 365.

XII. The *Pareira Brava* is a Root which comes to us from *Brazil* by the way of *Lisbon*, but which the War has rendred pretty ſcarce; however it is to be found among the good Druggiſts, and is ſold at *Paris* for 40 *Livres* the Pound: 'tis call'd in *Brazil* the univerſal Medicine, and is made uſe of there in all kind of Diſtempers. A Capuchin Monk, who came from thence, told me that he could not give it a greater Character than by aſſuring me, that in all their Voyages they carryed the Goſpel in one Pocket and the *Pareira Brava* in the other. Experience ſhews us that the *Pareira Brava* does abundantly provoke Urine, whence it will follow, That it will diſcharge by the Kidneys the corroſive Acidity of the Maſs of Blood; it is alſo good to break and thin the pituitous and viſcous Humours; and it cures the Suppreſſions of Urine occaſion'd by Obſtructions in the Kidneys. One may conclude from hence, that the Salts of the *Pareira Brava*, which are moderately Volatile, are proper to diſſolve or ſeparate the too thick and too cloſe Texture of the Sulphur of the Lympha. Finally this Medicine has a light or gentle Bitterneſs which corrects the Acids of the Stomach, and renders them more pure and fine. Hence the Chyle becomes better digeſted and more Balſamick, and fitted to aſſimilate it ſelf with the Blood, and to preſerve therein that degree of Diviſion and Fluidity which is neceſſary for it.

The Method of uſing this Root with Succeſs, is to reduce it to an impalpable Powder, and to infuſe thereof the weight of a Demi-gros in a Pint of boyling Water, and let it lye in it all Night, and next Morning boyl it one Moment. Then pour the Liquor off gently from the Powder, and take of it a Demi-ſetter in two Cups with a little Sugar as hot as Tea, putting into each Cup 5 Grains of the ſaid Root reduced to an impalpable Powder, which you muſt ſtir with a Spoon, that none of it may remain at the Bottom. You may repeat the ſame Doſe about 4 Hours after Dinner, but you muſt not eat any thing within an Hour after you have taken it. This Medicine does not oblige you to alter the ordinary courſe of your living; and you may continue the uſe of it ſeveral Months together, in which time alſo you may diſcontinue it two or three Days together at a time, if you pleaſe; but you ſhould take ſome gentle Purge every Fortnight or Three Weeks during the uſe of the ſaid Medicine.

Preparation of the Root.

Take eleven Grains of this Root, and put it into a Pewter Tea Pot filled with boyling Water, and ſo let it infuſe all Night over warm Aſhes, or a very ſmall Fire; and in the Morning boyl it again, but very gently, till you uſe it; you muſt drink it juſt as you do Tea, and the Liquor which comes from that Infuſion, muſt not exceed the Quantity of 5 ſmall Diſhes of Tea.

Of the Jeſuits-Bark, *by Dr.* Will. Oliver, *n.* 290. *p.* 1596. *com by Mr.* Petiver.

XIII. *Peru-Bark* comes from a Tree about the bigneſs of a Plumb-Tree, with Leaves like Ivy, but not quite ſo big, and are always green. The *Indians* call it *Querango.* 'Tis gather'd in *Autumn*, and the Rind taken off all round, as well from the Boughs as the Trees, which grows again in four Months as Cork does. The Trunk is about the Bigneſs of a Man's Thigh: It bears a Fruit not unlike a Cheſnut, (except its outer Rind or Shell) which is properly call'd *China China*, and is eſteem'd by the Natives above the Bark taken from the Trunk or Boughs. This Account I received from an ingenious Apothecary at *Cadiz* in *Spain*, A. D. 1694. who had liv'd in *Peru*, and ſeen it growing, and gather'd it ſeveral Times. From this Hiſtory I made this Obſervation, that probably *China China*, or the Rind of the Fruit, was firſt only in Uſe, and the more powerful Medicine us'd in ſmaller Quantities, and that the Bark of the Tree came not into play till ſome time after; when the Virtues of it known in *Europe* occaſion'd a greater Demand for it.

A new kind of Walnut Tree, by Mr. Reneaume, *n.* 273. *p.* 908.

XIV. The Oil preſt out of the Walnut-Tree in certain Provinces, is us'd inſtead of Butter and Oil Olive. In *Berry*, where they have good Wool, and trade much in Cattle, the little Butter they have is worth nothing and very dear, ſo that they uſe Nut Oil in dreſſing their Meat to eat. For this Reaſon, there are an infinite number of Walnut-Trees planted in the middle of the plough'd-Lands, in ſuch ſort, that afar off one would take theſe Lands for Woods of Walnut-Trees.

The laſt *Autumn*, I being gone to ſee one of my Kinſmen, who was at his Country Houſe, two Leagues from *Selles* in *Berry*, in the Pariſh of *Lis*, as I walked in an Orchard looking upon ſome Plants, near a place where they bred up a vaſt number of young Walnut-trees, I perceiv'd in the middle, a ſort of Leaf (or foliage) which I had never taken notice of before. I went thither forthwith (with much Eagerneſs) and having examin'd it, as I knew not the ſubſtance of this Leaf, I taſted it. The taſte, ſmell, wood and figure of the Tree, perſwaded me to believe that it was a Walnut-Tree, and I concluded that this was one, tho' I did not remember that I had ever read, or heard of any ſort like this.

This Tree is very young, and did never yet bear any Fruit, perhaps, becauſe it may be *(in a manner)* choak'd up, and that there is neither Air nor Nouriſhment enough, by reaſon of the great number of other Walnut-Trees, which grow round about it. It is near ſix Foot high, and two Inches Diameter at the bottom. 'Tis adorned at the top with many Branches, and (as the Country People ſaid) was about eight or nine Years old, and that they had always found its Leaves like thoſe which I ſaw. I cut off a little Branch of it, but having no Paper or Book with me, I cou'd not preſerve the Leaves ſo well as I wiſh'd.

The (*common*) Walnut-Tree bears its Leaves by pairs, upon a Stalk which terminates with a like Leaf, that is ordinarily bigger than the reſt: And it has very ſeldom above three pairs upon each ſtalk. This has ſometimes four or five pairs, and ſometimes more, which are one while oppoſite, another while alternate, although its Leaves appear ſmaller than thoſe of the common Walnut-Tree, becauſe of the Cuttings or *Slaſhes*. They are nevertheleſs as big, if one minds their Circumference taken from the Extremities of theſe *Slaſhes*.

The firſt Pair, and ſometimes the ſecond are leſs *cut* than the reſt, being ſo only upon the Circumference; but the others are cut ſo deep, that it looks as if the Nerve in the middle of the Leaf was only a Stalk. And the *Cuts* of the Leaves are ſometimes by Pairs, ſometimes ſingle on one ſide. Theſe Leaves are ſometimes forked at the end, and ſometimes end with a point. There are alſo ſome places, where it looks as if the Leaf was torn on purpoſe, almoſt like the *Angelica Canadenſis, foliis quaſi præmorſis*. There are others, where it ſeems that they are double, as if the Stalk or the Nerve was winged, juſt as the winged Stems or Trunks, or *Caules alati*. All theſe Cuts and Slaſhes are not like Indentures or Notches, but finiſh with a Round. And notwithſtanding all theſe Irregularities, they look ſo pretty, that I can't compare them better *(to any thing)* than thoſe wrought Leaves, which ſerve for Ornaments to the Painters, almoſt like thoſe which adorn the Capital of (*Columns of*) the *Corinthian* Order, or that which in Heraldry they call *the Mantles*, or that which the Botaniſts term *Acante* or *Branch Urſine*, which is the firſt original of this ſort of Ornament.

I will add here, by the by, that *Dalechamp* has obſerv'd an aerial Honey of a yellowiſh Colour, upon the Leaves of a Walnut-Tree, during the greateſt Heats of the Summer. Which can be nothing but an Effect of the Tranſpiration of the Tree, as of all other Trees, wherein the ſame thing is to be found.

An Account of a Tartarian Plant call'd Ginſeng, *n.* 337. *p.* 237.

XV. Towards the end of *July* 1709. we arrived at a Village not above four ſmall Leagues diſtant from the Kingdom of *Corea*, which is inhabited by thoſe *Tartars* called *Calca tatze*. One of theſe *Tartars* went and found upon the neighbouring Mountains four Plants of the *Gin-ſeng*, which he brought us entire in a Basket: I took one of them, and deſigned it, in its exact Dimenſions as well as I could poſſibly do it; the Figure of which I here ſend you, and ſhall give you the Explanation of it at the end of this Letter. The moſt eminent Phyſicians in *China* have writ whole Volumes upon the Virtues and Qualities of this Plant; and make it an Ingredient in almoſt all Remedies which they give to their chief Nobility; for it is of too high a Price for the common People. They affirm, that it is a Sovereign Remedy for all Weakneſſes occaſion'd by exceſſive Fatigues either of Body or Mind; that it diſſolves Pituitous Humours; that it cures Weakneſs of the Lungs and the Pleuriſy; that it ſtops Vomitings; that it ſtrengthens the Stomach and helps the Appetite; that it diſperſes Fumes or Vapours; that it fortifies the Breaſt, and is a Remedy for ſhort and weak Breathing; that it ſtrengthens the vital Spirits, and increaſes Lymph in the Blood; in ſhort, that it is good againſt Dizzineſs of the Head, and Dimneſs of Sight, and that it prolongs Life in old Age. No Body can imagine that the *Chineſe* and *Tartars* would ſet ſo high a value upon this Root, if it did not conſtantly produce a good Effect. Thoſe that are in Health often make uſe of it to render themſelves more vigorous and ſtrong: and I am perſwaded that it would prove an excellent Medicine in the Hands of any *European* who underſtands Pharmacy, if he had but a ſufficient quantity of it to make ſuch Tryals as are neceſſary, to examine the nature of it Chymically, and to apply it in a proper quantity according to the Nature of the Diſeaſe for which it may be beneficial.

It is certain that it ſubtilizes, increaſes the Motion of, and warms the Blood; that it helps Digeſtion, and invigorates in a very ſenſible manner. After I had deſigned the Root, which I ſhall hereafter deſcribe, I obſerved the ſtate of my Pulſe, and then took half of the Root, raw as it was and unprepar'd: In an Hour after I found my Pulſe much fuller and quicker; I had an Appetite, and found my ſelf much more vigorous, and could bear Labour much better and eaſier than before. Four Days after, finding my ſelf ſo fatigued and weary, that I could ſcarce ſet on Horſeback, a Mandarin who was in company with us perceiving it, gave me one of theſe Roots: I took half of it immediately, and an Hour after I was not the leaſt ſenſible of any Wearineſs. I have often made uſe of it ſince, and always with the ſame Succeſs. I have obſerved alſo, that the green Leaves, and eſpecially the Fibrous part of them chewed, would produce nearly the ſame effect. The *Tartars* often bring us the

Leaves of *Gin-ſeng* inſtead of Tea; and I always find my ſelf ſo well afterwards, that I ſhould readily prefer them before the beſt Tea. Their Decoction is of a grateful Colour; and when one has taken it twice or thrice, its Taſte and Smell become very pleaſant.

As for the Root of this Plant, it is neceſſary to boyl it a little more than Tea, to allow time for extracting its Virtue; as is practiſed by the *Chineſe* when they give it to ſick Perſons, on which occaſion they ſeldom uſe more than the fifth part of an Ounce of the dryed Root. But as for thoſe that are in Health, and take it only for Prevention, or ſome ſlight Indiſpoſition, I would adviſe them not to make leſs than ten Doſes of an Ounce, and not to take of it every Day. It is prepared in this manner: The Root is to be cut into thin Slices, and put into an Earthen Pot well glazed, and filled with about a quarter of a Pint of Water, *Paris* Meaſure: The Pot muſt be well covered, and ſet to boyl over a gentle Fire; and when the Water is conſumed to the quantity of a Cupfull, a little Sugar is to be mixt with it, and it is to be drank immediately. After this, as much more Water is to be put into the Pot upon the remainder, and to be boyled as before, to extract all the Juice and what remains of the ſpirituous part of the Root. Theſe two Doſes are to be taken, one in the Morning, and the other at Night.

As to the Places where this Root grows, it is between the thirty ninth and forty ſeventh Degree of Northern Latitude, and between the tenth and twentieth Degree of Eaſtern Longitude, reckoning from the Meridian of *Peking*. There is there a long Tract of Mountains, which the thick Foreſts, that cover and encompaſs them, render almoſt unpaſſable. It is upon the Declivities of theſe Mountains and in theſe thick Foreſts, upon the Banks of Torrents or about the Roots of Trees, and amidſt a thouſand other different ſorts of Plants, that the *Gin-ſeng* is to be found. It is not to be met with in Plains, Vallies, Marſhes, the bottoms of Rivulets, or in Places too much expoſed and open. If the Foreſt take Fire and be conſumed, this Plant does not appear till two or three Years after: It alſo lies hid from the Sun as much as poſſible; which ſhews that Heat is an Enemy to it. All which makes me believe, that if it is to be found in any other Country in the World, it may be particularly in *Canada*, where the Foreſts and Mountains, according to the relation of thoſe that have lived there, very much reſemble theſe here.

The Places where the *Gin-ſeng* grows are on every ſide ſeparated from the Province of *Quan-tong* (which in our old Maps is called *Leaotum*) by a Barrier of wooden Stakes which incompaſſes this whole Province, and about which Guards continually patroll to hinder the *Chineſe* from going out and looking after this Root. Yet how vigilant ſoever they are, their Greedineſs after Gain incites the *Chineſe* to lurk about privately in theſe Deſerts, ſometimes to the number of two or three thouſand, at the hazard of loſing their Liberty and all the Fruit of their Labour, if they are taken either as they go out of or come into the Province.

The

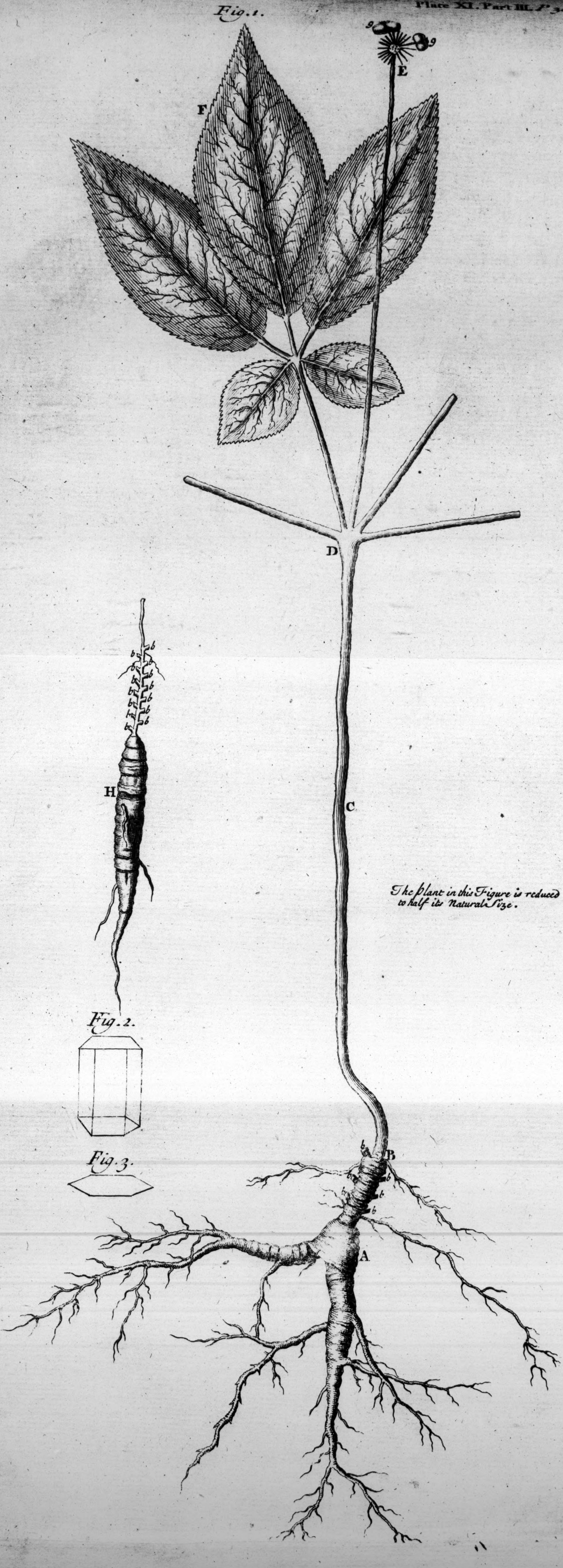


Fig. 1.
9
9
E
F
D
C
b
H
B
A
Fig. 2.
Fig. 3.

The plant in this Figure is reduced to half its Natural Size.

The Emperor having a mind that the *Tartars* ſhould have the Advantage that is to be made of this Plant rather than the *Chineſe*, gave Orders in 1709. to ten Thouſand *Tartars* to go and gather all that they could of the *Gin-ſeng*, upon condition that each Perſon ſhould give his Majeſty two Ounces of the beſt, and that the reſt ſhould be paid for according to its weight in fine Silver. It was computed, that by this means the Emperor would get this Year about twenty thouſand *Chineſe* Pounds of it, which would not coſt him above one fourth part of its value. We met by chance with ſome of theſe *Tartars* in the midſt of thoſe frightful Deſerts: And their *Mandarins*, who were not far diſtant out of our way, came one after another, and offer'd us Oxen for our Subſiſtence, according to the Commands they had received from the Emperor.

This Army of Herbariſts obſerved the following Order. After they had divided a certain Tract of Land among their ſeveral Companies; each Company, to the number of an hundred, ſpreads it ſelf out in a ſtrait Line to a certain fixt Place, every ten of them keeping at a diſtance from the reſt. Then they ſearched carefully for the Plant, going on leiſurely in the ſame Order; and in this manner in a certain number of Days, they run over the whole ſpace of Ground appointed them. When the time is expired, the *Mandarins*, who are encamp'd with their Tents in ſuch places as are proper for the ſubſiſtence of their Horſes, ſend to view each Troop, to give them freſh Orders, and to inform themſelves if their number is compleat. If any one of them is wanting, as it often happens, either by wandring out of the way, or being devoured by wild Beaſts, they look for him a Day or two, and then return again to their Labour as before.

A. Shows the Root of the Plant; which when waſh'd, was white, *Plate* 11. and a little rugged and uneven, as the Roots of other Plants generally are.

B. C. D. repreſent the Length and Thickneſs of the Stalk; which is ſmooth and pretty round, of a deepiſh red colour, except near its beginning at *B.* where it is whiter, by reaſon of its nearneſs to the Ground.

D. is a ſort of Knot or Joynt, made by the ſhooting out of four Branches, which all riſe from the ſame Center, and divide one from another at equal diſtances at the ſame height from the Ground. The underſide of the Branch is green, mixt with white; the upper part is much like the Stalk, of a deep red, inclining to the colour of a Mulberry. Theſe two colours gradually decreaſe and unite together on the ſides in a natural mixture. Each Branch has five Leaves, as repreſented in the Figure. It is remarkable, that theſe Branches ſeparate from each other at equal diſtances, as well in reſpect of themſelves, as of the Horizon, and make with their Leaves a circular Figure nearly parallel to the Surface of the Ground.

Tho' I have finiſh'd the deſign but of half of one of the Leaves at *F.* yet any one may eaſily conceive and perfect the reſt in the ſame manner. I do not know that ever I ſaw Leaves ſo large as theſe that were ſo thin and fine: Their Fibres are very diſtinguiſhable; and on the upper ſide they have ſome ſmall whitiſh Hairs. The Skin between the Fibres riſes a little in the middle above the level of the Fibres. The colour of the Leaf is a dark green above, and a ſhining whitiſh green underneath. All the Leaves are ſerrated, or very finely indented on the edges.

From *D.* the Center of the Branches, there riſes a ſecond Stalk *D. E.* which is very ſtraight and ſmooth, and whitiſh from bottom to top, bearing a Bunch of round Fruit of a beautiful red colour. This Bunch was compoſed of twenty four Berries, two of which I have here drawn, marked 9. 9. The red Skin that covers the Berry is very thin and ſmooth: It contains within it a white ſoftiſh Pulp. As theſe Berries were double (for they are ſometimes found ſingle) each of them had two rough Stones, ſeparated from one another, of the ſize and figure of our common Lentils, excepting that the Stones have not a thin edge like Lentils, but are almoſt every where of an equal thickneſs. Each Berry was ſupported by a ſmooth, even, and very fine Sprig, of the colour of thoſe of our ſmall red Cherries. All theſe Sprigs roſe from the ſame Center, and ſpreading exactly like the Rays of a Sphere they make the Bunch of Berries that they bear of a circular form. This Fruit is not good to eat. The Stone is like the Stones of other common Fruit; it is hard, and incloſes a Kernel. It is always placed upon the ſame Plan or Level with the Sprig that bears the Berry. From whence it is, that the Berry is not round, but a little flat on each ſide. If it be double, there is a kind of Depreſſion, or hollow place in the middle, where the two parts unite. It has alſo a ſmall Beard at top, diametrically oppoſite to the Sprig on which it hangs. When the Berry is dry, there remains only a ſhrivel'd Skin that ſticks cloſe to the Stones, and is then of a dark red or almoſt black colour.

This Plant dyes away; and ſprings again every Year. The number of its Years may be known by the number of Stalks it has ſhot forth, of which there always remains ſome Mark; as may be ſeen in the Figure by the Letters *b. b. b.* &c. From whence it appears that the Root *A.* was ſeven Years old, and that the Root *H.* was fifteen.

There are ſome Plants, which beſide the Bunch of Berries I have deſcribed, have alſo one or two Berries like the former, placed an Inch or an Inch and a half below the Bunch. And when this happens, they ſay, if any one takes notice of the point of the Compaſs that theſe Berries direct to, he can't fail of finding the Plant at ſome Paces diſtant that way, or thereabouts. The colour of the Berries, when the Plant has any, diſtinguiſhes it from all others, and makes it remarkable at firſt Sight: But it ſometimes happens that it bears none, though the Root be very old; as that marked by the Letter *H.* had no Fruit, though it was in its fifteenth Year.

They having ſowed the Seed in vain, without its producing any Plant, might probably give occaſion to this Story, which is current among the

Tartars. They ſay that a Bird eats it as ſoon as it is in the Earth, and not being able to digeſt it, it is purified in its Stomach, and afterwards ſprings up in the place where it is left by the Bird with its Dung. I rather believe that the Stone remains a long time in the Ground before it ſhoots out any Root. And this Opinion of mine ſeems the more probable, becauſe there are found ſome Roots, which are not longer and not ſo big as ones little Finger, tho' they have ſhot forth ſucceſſively at leaſt ten Stalks in as many different Years.

Tho' the Plant I have here deſcribed had four Branches, yet there are ſome that have but two, others but three, and ſome that have five or ſeven; which laſt are the moſt beautiful: Yet every Branch has always five Leaves, as well as this here figured, unleſs the number has been diminiſhed by any Accident. The Height of the Plants is proportionable to their Bigneſs and the number of their Branches. Thoſe that bear no Fruit are commonly ſmall and very low. The Root, the larger and more uniform it is, and the fewer ſmall Strings or Fibres it has, is always the better: On which account that marked with the Letter *H.* is preferable to the other. I know not for what reaſon the *Chineſe* call it *Ginſeng*, which ſignifies *the Repreſentation* or *Form of Man*: Neither I myſelf, nor others who have inquired into it could ever find it had any reſemblance to the Signification of its Name. The *Tartars* with more reaſon call it *Orhota*, which ſignifies *the Chief of Plants*. Thoſe that gather this Plant preſerve only the Root, and bury together in ſome certain place in the Earth all that they can get of it in ten or fifteen Days time. They take care to waſh it well, and cleanſe it with a Bruſh from all extraneous Matter. Then they dip it into ſcalding Water, and prepare it in the fume of a ſort of yellow Millet, which communicates to it part of its Colour. The Millet is put into a Veſſel with a little Water, and boyls over a gentle Fire; the Roots are laid upon ſmall tranſverſe pieces of Wood over the Veſſel, and are thus prepared, being covered with a Linnen Cloath or ſome other Veſſel placed over them. They may alſo be dryed in the Sun, or by the Fire; but then, though they retain their Virtue well enough, they have not that yellow Colour which the *Chineſe* ſo much admire. When the Roots are dryed, they muſt be kept cloſe in ſome very dry Place; otherwiſe they are in danger of corrupting, or being eaten by Worms.

XVI. *Araliaſtrum* is a *Genus* of Plants, whoſe *Flower A.*[*] is complete[†], regular, polypetalous, and hermaphrodite, ſtanding on the *Ovary B.* The *Ovary*, which is crown'd by a *Calyx* cut into ſeveral parts, becomes a Berry *D*, in which are, for the moſt part, two flat Seeds like a Semicircle, which both together repreſent a ſort of a Heart. Add to this the Stalk, which is ſingle, ending in an Umbel of which each Ray bears but one Flower. Above the middle of the Stalk come

A new Genus of Plants, of which the foregoing is a Species, com. by Dr. Sherrard, n. 354. p. 705.

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[*] *vid.* Aralia *Inſt. rei herb.* Tab. 154. [†] Complete, *that is to ſay, that has a* Calyx.

out ſeveral *Pedicles*, (as on that of the *Anemone*) on the Extremities of which grow ſeveral Leaves like Rays, or like an open Hand. *The* Species *of this* Genus *are*,

1. *Araliaſtrum Quinquefolii folio, majus, Nin-zin vocatum D.* Sarrazin. *Gin-ſeng*. Des lettres edifiantes & curieuſes, *Tom.* X. *pag.* 172.

2. *Araliaſtrum Quinquefolii folio, minus.* D. Sarrazin. *Plantula Marilandica, foliis in ſummo caule ternis, quorum unumquodque quinquefariam dividitur, circa margines ſerratis.* N° 36. Raii Hiſt. III. 658.

3. *Araliaſtrum Fragrariæ folio, minus.* D. Vaillant. *Naſturtium Marianum Anemones ſylvaticæ foliis, enneaphyllon, floribus exiguis.* Pluk. Mantiſſ. 135. Tab. 435. Fig. 7.

To ſhew wherein *Araliaſtrum* differs from *Aralia*, (from whence it takes its Name) 'tis convenient to give alſo the Character of this laſt *Genus*, ſuch as Mr. *Vaillant* eſtabliſh'd it, in his Demonſtrations of the Year 1717.

Aralia * is altogether like the *Araliaſtrum*, as to the Structure and Situation of its Flower; but its Berry conſiſts of five Seeds plac'd round an *Axis*. Moreover, its Leaves are branched, almoſt like thoſe of *Angelica*; and its Stalks (which in ſome *Species* are naked, and in others have Leaves ſet alternately) bear each ſeveral Umbels at their top, in the Form of a Bunch of Grapes. *The* Species *of* Aralia, *are*,

* vid *Inſt. rei Herb.* 300. Tab. 154.

1. *Aralia caule aphyllo, radice repente.* D. Sarrazin. *Chriſtophorian Virginiana Zarzæ radicibus ſurculoſis & fungoſis, Sarſaparilla noſtratibu dicta.* Pluk. Almag. 98. Tab. 238. Fig. 5. *Zarſaparilla Virginienſibus noſtratibus dicta, lobatis umbelliferæ foliis, Americana.* Ejuſd. Almag. 396.

2. *Aralia caule folioſo lævi*, D. Sarazzin. *Aralia Canadenſis.* Inſt. rei Herb. 300.

3. *Aralia caule folioſo & hiſpido*, D. Sarazzin.

4. *Aralia arboreſcens ſpinoſa*, D. Vaillant. *Angelica arboreſcens, ſpinoſa, ſeu Arbor Indica, Fraxini folio, cortice ſpinoſo.* Raii Hiſt. II 1798. *Chriſtophoriana arbor aculeata Virginienſis* Pluk. Almag. 98. Tab. 2

All the *Species* of theſe two *Genera*, except the laſt of each of them, are common in *Canada*. The Inhabitants of that Colony, and thoſe o *Virginia*, call the firſt *Species* of *Aralia* by the Name of *Sarſaparilla*, becauſe its Roots have almoſt the ſame Figure and Vertues. Mr. *Sarrazin* writes from thence, that he had a Patient who had been cured of an *Anaſarca*, about two Years before, by the uſe of a Drink made of theſe Roots, and aſſures us, That the Roots of the ſecond *Species*, well boyl'd and apply'd by way of *Cataplaſme*, are very excellent for the curing of old Ulcers; as alſo the Decoction of them, with which they bath and ſyringe the Wounds. He does not at all doubt, but the Virtues of the third *Species* (which I ſhall briefly deſcribe) are the ſame with thoſe of the ſecond.

Its Roots creep, and ſend forth Stalks, which riſe commonly to the height of a Foot and half, and ſometimes to two Foot; the bottom part of f them is rough, with reddiſh, ſtiff and prickling Hairs. Theſe Stalks re ſet from the bottom to almoſt the top (which are divided ſucceſſively into ſeveral naked Branches charg'd with Umbels) with branch'd alternate Leaves, almoſt like thoſe of *Podagraria hirſuta Angelica folio & odore* D. Vaillant; which Plant is grav'd in the ſecond Tome of Boccone's *Muſæum*, by the Name of *Cerefolium rugoſo Angelica folio, Aromaticum*, Tab. 19. and in *Rivini* by that of *Myrrhis folio Podagraria*.

An undeſcrib'd Plant in Merionethſhire, *by Mr.* Lhwyd, *n.* 337. *p.* 275.

XVII. The whole Plant is of a ſtraw Colour, and much of the bigneſs the *Figure* repreſents it. The Stems are hollow, and fill'd with a kind of thick reddiſh Liquor, as much like Blood [or Gore] as the Juice of Plants, inſomuch that it ſeems referrable to the Zoophyts. If you preſs theſe Stems at the bottom, between your Fingers, the red Liquor is forc'd up, and cauſes the drooping Flowers [or Seed Veſſels] to mount erect.

Obſervations on the Vertues and Properties of Sugar, by Dr. Slare. *n* 337. *p.* 273.

XVIII. I have had reaſon to give a great Character of Sugar, on account of ſome extraordinary Effects it ſeem'd to have on my Grandfather forty Years ſince. He made it his daily practice to take or lick up as much Sugar as his Butter ſpread upon Bread would receive, for his conſtant Breakfaſt, unleſs he happened to exchange it for Honey ſometimes. He frequently ſweetned his Ale and Beer with Sugar: He had Sugar put to all the Sauces he uſed with his Meat. He had all his Teeth in his Mouth at 80 Years, ſtrong and firm; never had any Pain or Soreneſs in his Gums, or Teeth; never refuſed the hardeſt Cruſt. In his 82d Year one of his Teeth dropt out, and ſoon after that a ſecond, which he put into my Hand, and was one of the fore-Teeth: He bid me feel the Cavity, where I ſtruck my Nail upon a Bone. In ſhort, all his Teeth came out in two or three Years, and the young ones filled up their room: He had a new Set quite round. His Hair from a very candid white became much darker. He continued in good Health and Strength, without any Diſeaſe, and dy'd in his 99th or 100th Year, of a *Plethora*, as I gueſs, for want of bleeding. He was a *Bedfordſhire* Gentleman of an old *Engliſh* Family; and the Caſe well known. This reconcil'd me much to vindicate Sugar, which I have done formerly before the *Royal Society*; and have ſhewn the unjuſt Calumny of the famous *Willis* againſt Sugar, who charges it with a Corroſive Liquor, as ad as *Aqua fortis*; He calls it *Aqua Stygia*. I examined it, and found he Charge unjuſt; that Sugar contain'd no worſe ſubſtance in it, than Milk and Honey, and *Manna*, nay even Bread it ſelf. The Experiments were approv'd of, and are in your Journals.

Some Years paſt I ſhew'd Dr. *Liſter* the Figure that Sugar did naturally make, or ſhoot into; and would have had him deſcribe it, and add t to thoſe curious Cuts of Salts before his Book of Mineral Fountains; ut we could not then well expreſs the Figure, which I have ſince been able to do more accurately. For the difficulty lies here; all other Salts ſhoot or cryſtallize, and make their Figure in a cool Place; but Sugar will cryſtallize only in a hot Stove, and is more apt to be compounded, and not to ſhew its true primitive Texture. Thus it happens to Snow, which in its true ſimple ſhape is an Hexagon; but cannot be always diſcover'd ſingle. This is yet more eaſy to be accounted for than Snow; and we have been able to chuſe ſuch parcels of that Sugar call'd Candy, as do repreſent the following Figure, being a Priſm, as you may ſee by the Figure. I never queſtion'd but that it was a true Salt, having all the Properties of a Salt; and therefore made many unſucceſsful Experiments before my Acquaintance with Sugar Bakers.

Plate LI. *Fig.* 2. *and* 3. Fig. 2. *Shews the Form of the Cryſtals or Salts of Sugar, having two* Baſes, *oppoſite, equal, and parallel; the other are Parallelogramms.*

Fig. 3. *Shews the* Baſis *of the preceeding Figure.*

American *Plants, by Dr.* Mather, *n.* 339. *p.* 62.

XIX. *Antieriſypelas*, a Plant efficacious in curing Inflammations; it grows plentifully in the Woods: A Chymical Oyl extracted from it, taken inwardly, does Wonders in abſorbing Scorbutick Salts. Another Plant, which goes by the Name of Partridge Berries, excellent in curing the Dropſy; a Decoction of the Leaves being drank ſeveral Days as a Tea, diſcharges a vaſt Quantity of Urine, as long as the Diſeaſe laſts: after which it may be drank without provoking Urine obſervably. Gouty Perſons drink it with Benefit.

A Root call'd the bleeding Root, curing the Jaundice in 5 or 6 Days.

Another call'd the Cancer Root, and a ſort of Devil's Bit, and a Thiſtle, call'd the Boars Thiſtle; a Decoction of theſe 3 Roots is a Cure for the *King's Evil*, though very far gone, a ſmall quantity being drank every Day; and the bruis'd Roots applied to the ſcrophulous Tumors.

A Plant call'd by the *Indians Tantuttipang*, infallible for the *Lues Venerea*, the Root being us'd in a Decoction, and drank half a Pint; a Cataplaſm of the ſame ſort bruis'd, apply'd to the Ulcers, cures them alſo.

Of the ſinking of Three Oaks into the Ground, com. by Peter Le Neve, *Eſq*; *n.* 355. *p.* 766.

XX. *July* 23. 1717. near the Seat of Sir *Charles Potts*, Bar. in *Norfolk*, in the Pariſh of *Manington*, (about Midway between *Holt* and *Aylſham*, and about 7 Miles from the Coaſt near *Cromer*) in the Daytime: firſt, one ſingle Oak, with the Roots and Ground about it, was ſeen to ſubſide and ſink into the Earth; and not long after, about forty Yards diſtance, two Oaks that were contiguous, ſunk after the ſame manner into a much larger Pit, being about 33 Foot Diameter, whereas the former is not fully 18. Theſe as they ſunk fell acroſs, ſo that obſtructing each other, only the Roots of one of them reaches the bottom, whereas the firſt ſtands perpendicular. When the firſt Tree ſunk, it was obſerved, that the Water boyl'd up in the Hole; but upon the ſinking of the greater Pit, that Water drain'd off into it, from the former, which now continues dry. The depth thereof to the firm bottom is nine

Foot three Inches; and the Tree that ſtands upright in it, is three Foot eight Inches in Girt, and its Trunk about 18 Foot long, half of which is now within the Pit. In the bottom of the greater Pit, there is a Pool of Water about 8 Foot Diameter; whoſe Surface is 11 Foot three Inches below the Ground, and the Trees that are in this Pit, are much of the ſame length with the other, but ſomewhat ſmaller, the one being in Girt 3 Foot 5 Inches, the other but two Foot 9 Inches. The Soil on which theſe Trees grew, is gravelly; but the bottom is a Quick-ſand over a Clay, upon which there are Springs, which feed large Ponds adjoyning to Sir *Charles Potts*'s Houſe, at about a quarter of a Mile from theſe Holes.

The Nature of the Soil ſeems to afford us a reaſonable conjecture at the Cauſe of this odd Accident, which ſome perhaps may be apt to reckon as a Prodigy. The Springs running over the Clay at the bottom of a Bed of very minute Sand, ſuch as your Quick-ſands uſually are, may reaſonably be ſuppoſed in many Ages to have waſht away the Sand, and to have thereby excavated a kind of ſubterraneous Lake, over which theſe Trees grew: And the force of the Winds, on their Leaves and Branches, agitating their Roots, may well have looſened the Sand under them, and occaſioned it to fall in, more frequently than elſewhere; whereby in length of time the thin Bed of Gravel being only left, it might become unable to ſupport its own weight and that of the Trees it bore. That this is not a bare Conjecture, may appear from the boyling up of the Water at firſt in the leſſer Hole, and its ſtanding in the bigger and lower. And if it ſhall be found that it was a very windy Day whereon this Accident happen'd, it will much add to the probability of this Solution.

A like ſinking of the Earth in London, *ibid.*

An Accident not unlike this lately happened in *Fleetſtreet*, *London*, by the defect of the arched Roof of a very deep Common-Sewer. The Earth gradually falling into the Sewer, was carried away by it, ſo as not to obſtruct the Water; and the continual Tremour of the Ground, occaſioned by the conſtant paſſing of Carts and Coaches, by degrees ſhook down the Earth, ſo as to leave a very great Cavern, the top whereof at length grew ſo very thin, that one Day a weighty Cart having juſt paſt it, a great ſpace of the Pavement ſunk in, in the middle of the Street, not without hazard to a Coach then driving by.

XXI. *Papers Omitted.*

1. Father *Camelli de Plantis Philippenſibus Scandentibus*, ſent very lately to Mr. *James Petiver*, F.R.S. to which is added a Catalogue of Herbs he formerly ſent him, the Deſigns of which are already deſcrib'd, by that moſt eminent Botaniſt Mr. *John Ray*, in the Appendix to his Third Volume of *Plants*. *n. 293. p. 1707*
2. A Second Part of the ſame. *n. 294. p. 1763.*

n.295 p.1809. 3. A Third Part of the ſame.

n.296 p.1816. 4. A Fourth Part.

n.336. p. 527. 5. An Extract of a Letter from the late Mr. *Edward Lhwyd*, to Doctor *Tancred Robinſon*, giving an Account of ſome uncommon Plants growing about *Penzance* and St. *Ives* in *Cornwall.*

n.332. p. 375. 6. An Account of ſeveral rare Plants, lately obſerv'd in ſeveral
n.333. p. 416. curious Gardens about *London*, and particularly the Company of *Apo-*
n 343. p. 229. *thecary's* Phyſick Garden at *Chelſea*, by Mr. *James Petiver*, F. R. S.
n.344 p. 269.
n. 337. p. 3 . in Seven Tracts.

177. n. 346. p.353. 7. An Account of Mr. *Sam. Browne's* Third Book of *Eaſt-India* Plants,
n.271. p. 843. with their Names, Virtues, Deſcriptions, by *James Petiver*; to which are added ſome Animals ſent him from thoſe Parts.

n. 274. p.933. 8. An Account of the Fourth Book.

n. 276.p.1007. 9. An Account of the Fifth Book.

n.277.p.1055. 10. The Sixth Book.

n.282.p. 1251. 11. An Account of the Seventh Book.

n. 287.p.1450. 12. The Eighth Book.

XXII. *Accounts of Books Omitted.*

n.285.p. 1411. 1. Gazophylacii Naturæ & Artis Decas I. In qua Animalia, Quadrupeda, Aves, Piſces, Reptilia, Inſecta, Vegetabilia; item Foſſilia, Corpora Marina, & ſtirpes Minerales e Terra eruta, Lapides figura inſignes, *&c.* Deſcriptionibus brevibus & Iconibus illuſtrantur. Hiſce annexa eſt Supellex Antiquaria, Numiſmata, Gemmæ exciſæ & Sculpturæ, Opera Figulinæ, Lucernæ, Urnæ, Inſtrumenta varia, Inſcriptiones, Buſta, reliquaque ad rem priſcam ſpectantia. Item Machinæ, Effigies Clarorum Virorum, omniaque arte producta. A *Jacobo Petiver*, R. S. S.

n.331. p. 342. 2. An Account of the remaining part of the firſt Volume, by Mr. *Petiver.*

n.310.p. 2442. 3. The whole Art of Husbandry, by *John Mortimer*, Eſq; 8*vo.*

4. Index Plantarum Horti Lugduno-Batavi. per *Herman Bœrhaven.*
n. 325. p. 35. Lugd. Bat. 1710. 8*vo.*

5. Lud. Ferd. Marſilii Diſſertatio de Generatione Fungorum, Romæ,
n.345. p. 350 1714. 8*vo.*

CHAP.

CHAP. VI.

Zoology.

I.
Of the taking and taming Elephants in Zeylan, *by Mr.* Strachan *n.*277. *p* 1051.

ALL the Natives within 20 Miles from the Sea Coaſt betwixt *Matura* and *Negumbo* are ſubject to the *Hollanders*, and know the Duty and Service which their *Eaſt India* Company requires of them; therefore when Orders are given to hunt the Elephants, they pitch upon a convenient place for a Warren or Park, which is broad at the Entrance, and turn the farther in the more narrow, ſo that at the end it is ſo narrow that an Elephant cannot turn himſelf; yet this narrow place is ſo long, that 20 Elephants may ſtand one behind another. The Park being perfected, the *Koolrale*, who is the Head or Chief of the *Kool* (which is to ſay in *Engliſh* a Shire) does order the Inhabitants who dwell thereabout to their places, who make a Circumference about the Woods, where they know that Elephants are, which will be the length of 60 *Engliſh* Miles. At firſt one Man ſtands from another at the diſtance of about 5 Poles, or 25 Yards, and kindles Fire in the Spaces between them, then by ſhooting, crying, beating of Drums, ſoundings of Horns, the Elephants retire towards the Park, and ſo from time to time the Men follow, ſhooting and making a Noiſe, until the Circumference be ſo little, that they ſtand upon one anothers ſide. The Elephants, when they find themſelves incloſed within the Park, make more Reſiſtance, ſome turning back upon the Men, but Poſts are ready ſtanding betwixt the Men and the Elephants, and long Stakes lying upon the Ground; they have only to lift theſe Stakes, and make the ends of theſe Stakes faſt to the Poſts, and thus the Elephants are encloſed within the Park. Then by following the Elephants, and caſting of Firebrands, they chaſe them ſtill farther toward the end of the Park, and cloſing up the Paſſage behind them, by ſetting up, and laying Stakes athwart the Poſts, until at laſt they are all entered into the narrow place, where they cannot turn themſelves. But becauſe there are many ſorts of Elephants, ſome being a great deal higher before than behind, and many who never have the two long Teeth; others are of a more ſavage Nature, which are known by their Eyes and Face, having a fierce Tyger-look, and will be for no Service, although they be kept 10 Years: Such ones the King of *Candie* keeps for puniſhing of Tranſgreſſors, for they kill all Perſons that come within their reach.

One of them the late King of *Candie* ſent to the *Hollanders* when I was there, in recompence of ſome Preſents, which the *Hollanders* had ſent to move him to Peace; among which Preſents a Lyon from the *Cape of Good Hope* was ſent, as being the King of all other Beaſts, but he never would let theſe Preſents come within 20

Miles of his Preſence. The *Hollanders* kept the ſame Elephant in a place by himſelf ſtill tyed, being at great Pains every Day to bring him to the Waterſide betwixt two tame Elephants, the *Hollanders* intending to ſhew the regard they had to that King's Gifts. Such like Elephants being among the other Elephants in the fore-mentioned Park, are kept out of the narrow Entrance by caſting Firebrands upon them when they draw near the narrow Entrance, and endeavour to kill them by Guns, and cutting off their Snout, by which they take all their Victuals; which being cut, they periſh for hunger when they are eſcaped, for the Natives being very ſwift, will come very near them with their Swords. When all the choice of the Elephants are entered into the narrow Paſſage, there are ſeveral Poſts put athwart, to prevent any of them from coming back; the reſt that are not fit for Service have liberty to eſcape.

It is eaſie to conceive how the Natives did invent the chaſing Elephants by Drums and Noiſe, becauſe it is obſerved that they themſelves are affrighted by Drums. I did hear an ancient *Portugueſe* relating, That when his Country-men were in Poſſeſſion of this Iſland, they did purſue the Natives too far among the Woods and Hills, the *Ceiloneſes* by this means got the advantage of the *Portugueſe*, and killed every one Man of them except one Drummer, who did obſerve them not to draw near where they did hear the Drum, he therefore beat upon his Drum continually; the *Ceiloneſes* thinking that the greateſt Power was where the Drum did beat, did not come near him, and by this means he ſaved his Life.

When the Elephants have been a while ſettled in the narrow Paſſage, they are one by one taken to the Stable, being tyed faſt between two tame Elephants bred for that purpoſe, the point of whoſe long Teeth are cut: If the wild Elephant be troubleſome, they will hold his Trunk with their Trunk, and beat him with their Teeth, a Man ſitting upon each of the tame Elephants, to direct them by a Staff, upon the end of which is a little Hook, wherewith he touches his Head, and orders the tame Elephant as he pleaſes, without a Bridle or the like. When they come into the Stable, they are led betwixt two Poſts, and Stakes put athwart before their Breaſts and under their Bellies, and ſo tyed that they cannot ſtir, nor lye down upon the Ground; for if they ſhould be permitted to lye down, they would turn heavy, ſorrowful, and would not eat, and dye. They are this way fed and nouriſhed with the Trunk of *Waltugas*, or *Plantains*. The Trunk of this Tree they love better than any other Food, and with theſe Trunks they are fed in the Ships; when they have been nouriſht ſo for Six Weeks they begin to be tractable, and are faſtened only with one Foot tyed with Cords; and if the Merchants come from *Bengal*, they are ſold and convey'd to the Ships; if the Merchants have no uſe for them, or that they cannot agree about the Price, they feed them with Leaves of the *Coco* Tree, until 12 Weeks be paſt after their being taken, and then they are as tame as a Dog, and eat Graſs with the Oxen in the Fields.

When the Elephants are put on board the Ships, there is a thing prepar'd of 15 or 20 double Sailcloath, which is laid about his Breaſt, Belly and Sides, and is tyed together upon his Back, whereunto Ropes are faſtened, then he is led into the Water betwixt Elephants bred for the purpoſe, upon which a Man ſits to govern him, and another Elephant (upon which ſits a Man) goes behind the Elephant that is to be ſhipp'd, and when this Elephant is unwilling to enter the Water, the Elephant that is behind, puts his Head to the foremoſts hinder parts, and preſſes him forward, which will cauſe any Perſon to laugh to behold the ſame; when he is got deep enough in the Water he is tyed to the Boat, the other Elephants return, and he ſwims after the Boat to the Ship, where he is haled over into the Ship.

But there is lately invented a more convenient way, which is this: There is prepared a big Veſſel, flat bottom'd, cover'd with Planks like a Floor, ſo that this Floor is almoſt of the height of the Key; then the ſide of the Key and the Veſſel are adorned with green Branches, ſo that the Elephant does ſee no Water till he be in the Ship.

When one Elephant ſwims to the Ship, or otherwiſe croſſes a deep River, nothing of him can be ſeen only his Snout thorough which he breathes: and when he is waſhed upon a River ſide, he ordinarily lyes with his Head upon the bottom of the Water flat alike with his Body, and although one ſide of him be above Water, his Head will be under, holding only his Snout above Water, through which he breathes.

When the Elephants are tame, they are very docil and tractable, ſo that they will lye upon their Belly when Men are to get up and ride upon them.

If they fall at any time, although upon even Ground, they either dye immediately, or languiſh after that until they dye: their Body being of ſo great a bulk, is the cauſe of the harm they get by a fall.

If an Elephant frequents a Plantation of Fruit-Trees of the Natives, for no Hedges can keep him out, they make a point upon a heavy piece of Wood, and hang it on a Branch of a Tree under which the Elephant uſes to come; and at Night a Man ſits watching upon that Branch, and when the Elephant comes under the Branch, the Man cuts the Cord, and ſo the point of the Wood falls a Foot deep in his Back, by which means the Elephant languiſhes and dyes; but when the ***Hollanders*** get intelligence hereof, they are puniſh'd ſeverely.

Of the Organ of Hearing in the Elephant, by Dr. Blair, *n.* 358. *p.* 886.

II. The ***Auris Externus*** of this big Creature lyes flat, and not Protuberant as in other Quadrupeds, whoſe Cartilaginous Subſtance is capable of divers Motions performed by ſeveral Muſcles, whereby the inner Ear is preſerv'd from the great Violence of the external Air, which upon ſome Occaſions might perhaps injure or break the thin and delicate Membrane of the *Tympanum*. It is alſo for this reaſon that the *Meatus* is further guarded, by the Contortions and oblique Poſition of the Cartilage at the Orifice of the *Meatus*, which only admits of a determinate quantity of Air, ſufficient for the Vibration of the *Membrana Tympani*, by which a diſtinct Sound is convey'd to the *Senſorium commune*; whereas did the Air admitted exceed its due Proportion, nothing but the confus'd Idea of a Sound would follow, ſuch as reſemble the ruſhing of Waters, *&c.* or that Noiſe often obſerv'd when, by a ſupervenient Cold or the like, Obſtructions are generated within the Ear it ſelf. And in Men, becauſe the *Auris externus* is alſo flat, not only are theſe Turnings and Windings obſervable in the Cartilage at the Entry, but the *Meatus* it ſelf is likewiſe obliquely ſituated, to prevent the aforeſaid Inconveniencies. But there is no need for ſuch a Contrivance in the *Elephant*, whoſe external Orifice of the *Meatus* is patulent, open (ſcarce being guarded by the Cartilage) and ſtreight, whoſe length (it reaching from the external to the internal Table of the Scull) is ſufficient to prevent the Acceſſion of too great a quantity of Air to the *Tympanum*; for in its Progreſs moſt of the *Columnæ Aeris* beat againſt one or other of the ſides of the *Meatus*, in ſo much that their force is inhibited, and only ſo many as ſuffice to convey the Sound, can reach the *Tympanum* it ſelf.

The *Meatus Auditorius* then is a long ſtreight Tube or *Canule* ſituated Horizontally, and reaching from the outer to the inner Table of the Scull, in Figure not unlike the Barrel of a Piſtol, but ſomewhat Oval, the ſides of whoſe Cavity are hard and ſolid, about the thickneſs of a Half-penny, from whoſe outer part ſeveral of the *Laminæ* betwixt the two Tables of the Scull do ariſe, (*Fig.* I.) Its Cavity is an Inch or $\frac{3}{4}$ of an Inch Diameter, and length $9\frac{1}{2}$ Inches; being ſomewhat enlarg'd as it arrives at the *Crena* for the *Membrana Tympani*, (*Fig.* 2.)

This *Crena* is two Inches in Circumference, within which is the *Cavitas Tympani*, conſiſting of two different Surfaces; the one much deeper and cellulous, the other more ſuperficial and ſmooth. The firſt runs perpendicularly down $\frac{1}{2}$ Inch from the *Crena Tympani*. Its bottom is variouſly divided into ſeveral *Cellules*, not unlike a Honey-Comb, but irregularly diſpos'd. Its bony *Laminæ*, by which theſe Cellules are diſtinguiſh'd from each other, are thicker at the top than the bottom, they being one Line, two Lines, or $1\frac{1}{2}$ Line diſtant from each other, and about $\frac{1}{4}$ Inch deep. Could I have got it ſo well cleans'd as I wiſh'd for, doubtleſs I might have obſerv'd their Communication with each other, by means of certain Orifices which ſerve to convey what ſuperfluous Moiſture is contain'd in them; for we may reaſonably ſuppoſe, as in all other Cavities of the Body, there are certain Glands for ſeparating proper Liquors convenient for the uſes deſigned; ſo here there ſeems to be a neceſſity for ſeparating a certain quantity of moiſture, fit to lubrifie the Muſcles of the Oſſicles, and facilitate their Motion; as alſo to preſerve the *Membrana Tympani* from becoming too dry. This dryneſs of the *Membrana Tympani*, and the thickneſs of the Liquor ſeparated by theſe Glands, is often the cauſe of a Deafneſs in humane Subjects; eſpecially thoſe that are advanc'd in Age. This cellulous Structure of the *Cavitas Tympani* ſeems to be very proper for receiving of the ſuperfluous Humidity; and theſe Communications are requiſite for conveying it from one Cellule to another, till it is emptyed into the *Receptaculum Commune* the *Aqueduct*, whereof hereafter.

This firſt or cellulous Cavity is two Inches broad, and reaches from the *Crena Tympani* to the *foramen Ovale*, or entry into the *Veſtibulum*, which is ſhut by the *Stapes*. The ſecond part of this Cavity is more ſuperficial (*Fig.* 2. (*e*), in form not unlike a Pear, from a narrow beginning becoming broader and more ſuperficial, terminating ſemicircularly, ſmooth in the Bottom, and having ſeveral incurvated Lines running acroſs it; it reaches much farther than the *Veſtibulum*, being one Inch five Lines from before to behind, and one Inch tranſverſly where broadeſt. What ſuperfluous Moiſture it contains is diſcharg'd into the fore-named Aqueduct.

Beſide the above-mentioned uſes for theſe two Cavities, *viz.* to receive and diſcharge the ſuperfluous Moiſture; they are alſo moſt beneficial and aſſiſting to the Hearing: for, no ſooner is the external Air modulated, and the *Membrana Tympani* mov'd thereby, than the Sound is conveyed by the *Oſſicles* to the *Nervus Auditorius*, and the Undulation continued, firſt by the *Anfractuoſities* of the firſt Cavity, and then by the *Gyres* and incurvated Lines of the ſecond, ſo that we may eaſily account for the acute Senſation of Hearing, wherewith *Elephants* are ſaid to be endow'd: For as the tame ones are moſt exact in obeying their Maſters Commands; ſo the wild ones are ſoon aware of what Traps or Snares are laid to catch them, by the tremulous Motion convey'd to their Ear from the cavous parts of the Earth, where the Pit into which it is expected they ſhould fall, is digg'd. It is eaſy therefore to explain whence the Acuteneſs of the Senſation of this Animal may proceed; for as the *Nervus Olfactorius* has a large Space and Bounds wherein to be diſpers'd, *viz.* the two Cavities of the *Proboſcis*, which are both long and large, ſo that ſcarce any *Columna aeris* can enter them, but ſome one or another of the Filaments of the *Nervus Olfactorius* diſpers'd in theſe Cavities muſt be toucht, whereby the Idea of ſmelling muſt be conveyed to the *Senſorium commune* in a more intenſe Degree, and the Animal ſoon become ſenſible of whatever approaches that is noxious or nauſeous to it, and thereby is taught how to avoid it; ſo this Structure, for a quick Conveyance and long Continuance of the Sound, is a great means both to make the *Elephant* ſoon receive the Sound and have a deep Impreſſion of it.

The *Aqueduct* is a flat Tube or Pipe, whoſe Orifice is ſo ſituated betwixt the two forementioned Cavities, that if there be any ſuperfluous Humidity contained in them, it muſt needs be diſcharged (at leaſt in this Animal) into the Mouth; for as it is ſituated where the firſt Cavity terminates, ſo the ſecond, from a broader and more ſuperficial beginning,

ning muſt needs diſcharge its Moiſture, by its more narrow and deeper Termination, into this Receptacle; alſo it deſcends directly towards the Mouth, paſſing through the Scull below the hole for the Jugular Vein (*m m*) betwixt the hole for the *Carotid* Artery, (*p p*) and that for the *Arteria duræ matris* (*q q*) whence deſcending (*n n*) it is joyn'd with its fleſhy part, which diſcharges it ſelf into the Mouth on each ſide, behind the back part of the inner Teeth of the upper Jaw. This Situation of the Aqueduct makes it plainly appear, that its Uſe is to receive the ſuperfluous moiſture from the *Cavitas Tympani*; for beſide the Glands above-mentioned, fit for ſeparating ſuch a quantity of Humidity as may lubrifie the Muſcles, and facilitate both their Motion and that of the *Oſſicles*; the very Vapours that ariſe in ſuch a Cavity as that of the *Tympanum* in this Animal, muſt at laſt be converted into a Liquor, and that muſt either again be receiv'd into the Blood Veſſels, or otherwiſe diſcharg'd by ſuch a Receptacle as this. Further, if there be a neceſſity for Glands in the *Meatus Auditorius* without the *Tympanum*, to ſeparate a certain Liquor, by which the acrimonious Particles of the Air are obtunded, and hindred from being offenſive to the Nervous Membrane of the *Tympanum*, (which muſt be of a moſt acute Senſation) and for moiſtning it, by which it the more eaſily receives the Vibration of the Air; ſo ſuch Glands as theſe ſeem to be moſt requiſite in the *Cavitas Tympani* for the Uſes above nam'd. And ſince what ſuper-abounds of this moiſture cannot be diſcharg'd outwardly as that of the *Meatus*, this Aqueduct ſeems to be moſt convenient for that purpoſe. Some are of opinion that this Aqueduct is alſo aſſiſting to the Hearing, eſpecially in Men; becauſe it is generally obſerv'd that they who are Deaf, open their Mouths wide, when they are deſirous to hear more diſtinctly: But I ſee not how that can be, for tho' the Cavity of the bony part of the Aqueduct, in moſt of Animals, is proportionally large enough; yet its carnous or fleſhy Part lyes for the moſt part ſo flat, and its two ſides are ſo collaps'd together, that ſcarce any Air can be admitted, at leaſt ſo far as to be ſubſervient to the Hearing.

The *Oſſicles* in this as in other Animals are three or rather four in number; for though I did not procure the *Os quadrangulare* of *Du Verney*, yet I have good reaſon to believe it was there; becauſe there is a conſpicuous *Sinus* in the Extremity both of the *Incus* and *Stapes*, where they are articulated, ſo big as to contain the Head of an ordinary Pin; and when I conſider the Angle which muſt have been form'd by the Articulation of theſe two Bones, I look upon this ſmall Bone to ſerve for the ſame purpoſes as the *Patella* in the Knee, and *Seſamoide* Bones in the Fingers and Toes.

The *Malleolus* is an irregular Bone, and doubtleſs has been endow'd with pretty large Muſcles, becauſe of the rugoſities, protuberances and *Sinus*'s obſervable in it. It has a protuberant Head (*Fig.* 4. (1.) four Lines broad, next to that a *Crena* or ſemicircular *Sinus*, (2.) after which the Bone is rais'd, affording a protuberant Margin to an oblong

Sinus (3) for receiving the Head of the *Incus*, 4 Lines broad. The oppoſite part of this *Sinus*, or back part of the Bone, is convex, of an unequal rugoſe Surface, with a great many Protuberances and Depreſſions, for the Origins and Inſertions of the Muſcles, for the ſpace of 5 Lines; where it forms an Angle, from whence it becomes flat and ſmooth, being 3 Lines broad and reaching four Lines to another Angle (5.) where the *Manubrium Malleoli* begins, and where it becomes more round; from whence it gradually tapers to the Point being ſix Lines in length.

The Head of the *Incus* is four Lines broad, *Fig.* 6. (1.) below which is the Neck or an oblique *Sinus*; (2) next to that are two *Apophyſes*, one on each ſide. Theſe deſcending obliquely outwards, and becoming flat, meet in a Point, *Fig.* 7. (5.) whence aſcending obliquely inward, this Production is joined to another ſmall round one, like the *Manubrium Malleoli* $4\frac{1}{2}$ Lines long (6.) This has the fore-mentioned ſmall Excavation or half round *Sinus*, (7.) which with the Extremity of the *Stapes*, I ſuppoſe to have contain'd the *Os quadrangulare*, or rather *Orbiculare*, according to the Figure of the *Sinus*.

The *Stapes* differs much in Figure from the Human one. From its Concave extremity 'tis inlarg'd on each ſide by two ſmall ſlender Productions, not unlike the Proceſſes of the *Vertebræ* of ſome Fiſhes *Fig.* 6. (22) to which is join'd the *Baſis*, (3.) ſo thin almoſt as the Scales of a Fiſh. This was accidentally ſeparated from its two ſides, and remain'd in the *Foramen Ovale*, from whence I pull'd it with a Pin; 'Tis Concave towards the *Stapes*, and Convex towards the *Veſtibulum*.

The *Foramen Ovale* lies ſo hid and obliquely in the ſide of the *Cavitas Tympani*, that it could not be delineated in its true Dimenſions. Near to it is another Hole oblong and ſharp at both ends, both which give an entry into the *Veſtibulum*.

The *Veſtibulum* is of an irregular Figue, *Fig.* 10. (*a*) 'tis for the moſt part three Lines from the one ſide to the other, and perforated by eight Orifices, *viz.* five for the Canals of the *Labyrinth*, *Fig.* 9, 10. (*a*) one for the *Cochlea*, *Fig.* 10. (*b*) andtwo for the *Feneſtræ* (*b, c.*)

The *Cochlea* is a long Cavity conſiſting of three *Gyres* or *Meanders*; *Fig.* 11. (*d e f*) its Orifice where it proceeds from the *Veſtibulum* is but ſmall; but it afterwards widens, ſo that the firſt Courſe of this Cavity is a third part larger than the ſecond (*e*) and proportionally the third is leſs than the other two (*f*), till it terminates in an Orifice (*g*) ſituated in the Top, for receiving a Branch of the ſoft portion of the *Nervus Auditorius*, which accompanies and paſſes along all its *Gyres*.

The Hardneſs and Solidity of the Bone (for which it may be juſtly called *Os Petroſum* in this Subject) was ſuch that I could not ſo exactly trace the three Canals or Ducts of the Labyrinth, ſo as to give a true Idea of the manner of their ſeveral Turnings. But *Valſalva's* Figures of the Humane Ear directed me ſo exactly, that I eaſily found out the ſeveral Orifices, and opened them ſo far as to find out their Situation and true Dimenſions, by introducing a Hogs Briſtle, then cutting it off and ſtretching it out to the Scale. Thus after laying open the two *Foramina* which gave an Inlet to the *Veſtibulum*, I ſoon perceiv'd the ſeveral Orifices which in ſo large Subject were pretty conſpicuous. I firſt turn'd to the one Hand and diſcovered the *Duct* of the *Cochlea*; this I purſued all along the Protuberance, *Fig*. 3. *(d)* in doing which I laid wholly open the *Leſſer Duct* of the *Labyrinth Fig* 9, 10. *(d)*. Then turning up the other ſide of the Bone, I trac'd the ſoft Portion of the *Nervus Auditorius* divided into two Branches, one whereof was diſtributed into the *Cochlea*, and the other to the *Labyrinth*. In filing the Bone a little further, I opened a ſmall part of the *Middle Duct*, and in a ſhort time I diſcovered the *Ductus Major*; after which I meaſured their ſeveral lengths as is ſaid.

The *Labyrinth* then conſiſts of three *Lineæ Semilunares* or incurvated *Ducts*, whereof the *Major* lyes in that part of the *Proceſſus Petroſus* which regards the Seat of the Brain (*b*). This is twenty Lines or one Inch eight Lines long. The *Medius Ductus*, one part whereof regards the Orifice of the *Cochlea*, and the other is common with the *Major* for the ſpace of three Lines; *(e)* this is fifteen Lines or one Inch three Lines long: And the *Minor* which regards the *Cavitas Tympani*, has one Orifice which is near to the *Medius*, where it approaches the *Cochlea*; and the other near to the Orifice of the *Major*. This is one Inch long.

The ſeventh pair of Nerves called in general the *Nervus Auditorius*, enters the *Proceſſus Petroſus*, and is divided into the hard and ſoft Portions, as in other Animals. In this Subject I find one Canule entring the Bone from the ſides of the Orifice for the *Carotide* Artery, about three Lines diameter, (*e*) *(h)* from thence running forward for the ſpace of one Inch four Lines, then bending downwards one Inch, till it meets with the Orifice at the Sides of the *Meatus Auditorius*, by which it pierces the Scull, and paſſes outward. This Canule, after it is entred the *Proceſſus Petroſus* for the ſpace of eight Lines communicates with the Orifice, which uſually enters the foreſaid Proceſs from the Baſe of the Scull; and both theſe Orifices, after they have accompany'd one another about five Lines, are ſeparated, and the ſoft Portion penetrates the Bone at two places as is ſaid.

I have now endeavoured to give ſuch a Deſcription of the *Oſſeous* or Bony part of the Ear of this ſtupendious Animal, as I am in hopes may be uſeful for the clearing up of ſome *Phænomena* in leſſer Subjects. At leaſt we may hereby obſerve, what a variety of Mechaniſm the great Author of Nature has thought fit to employ, in the ſeveral Parts of different Species of Animals. Thus both the external Ear of Man, and of the Elephant lye flat, as being moſt convenient: for if they had been protuberant as in moſt Quadrupeds, how unſuitable would it have been in Man, who is the moſt perfect of all Creatures, not upon the account of his Reaſon alone, but alſo as he is a Pattern

for

Fig. 1,

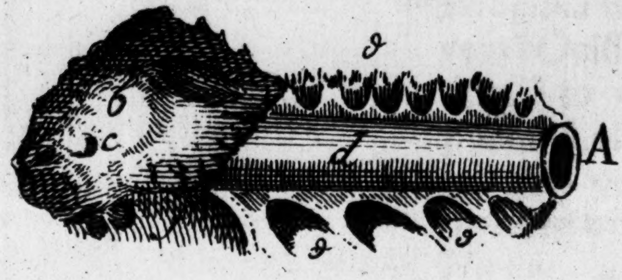


Fig. II.

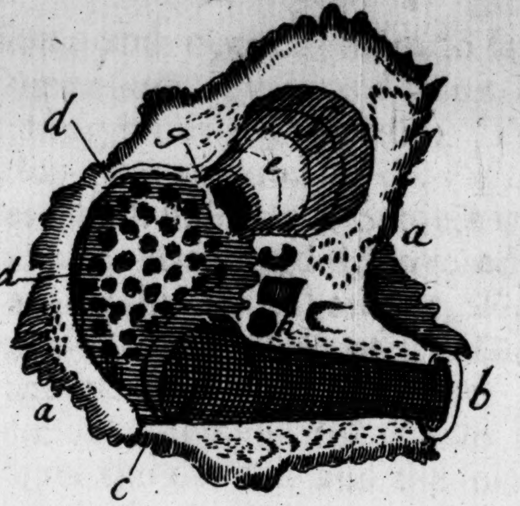


Fig. III

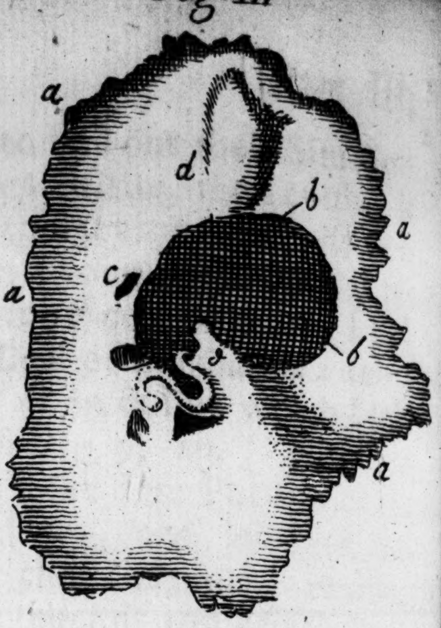
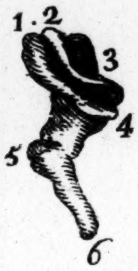


Fig. IIII



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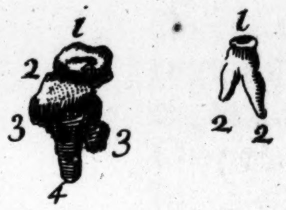
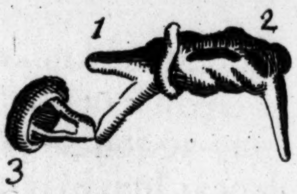


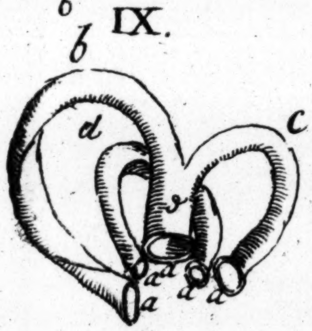
VI

VII.

VIII.



IX.



X

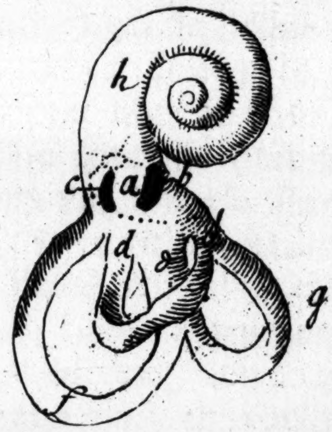


Fig XI

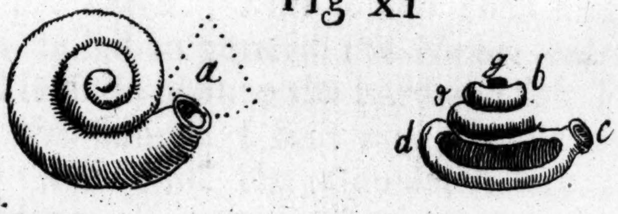


Fig. 12.

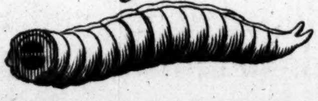


Fig. 13.

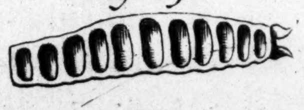


Fig: 14

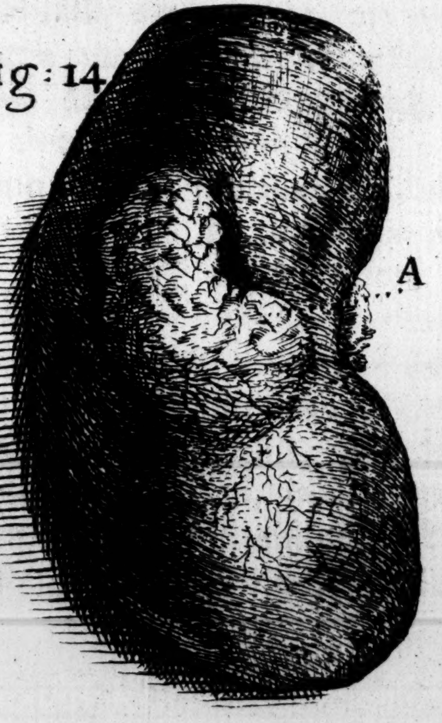
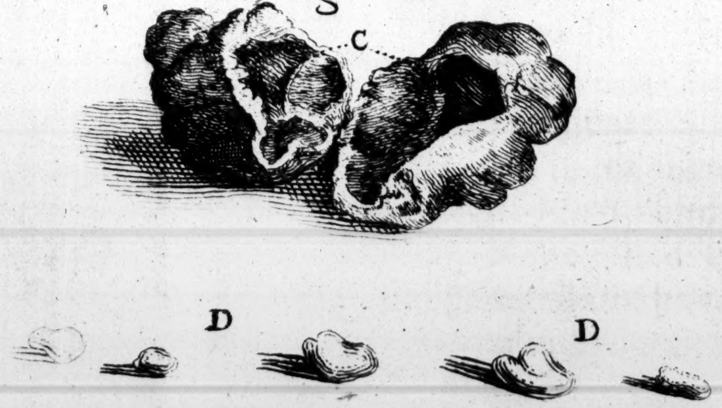


Fig: 15.

Fig: 16:



for Beauty and the Symmetry of his Parts; and how unſeemly would it have been in the Elephant, if his external Ear had ſtuck out, and been proportional to his other Parts; conſidering what an extraordinary aſpect he makes already by his Trunk and Tusks? But the Ears in theſe two Subjects differ by the Tortuoſity of the Cartilage, and oblique *Meatus*, to prevent the Injury of the Air, by its immediate acceſs into the inner Ear in Man: whereas in the Elephant the external Orifice is fully expos'd to the Air; but then the length of the *Meatus* hinders any more Air than is convenient from arriving at the *Tympanum*. We likewiſe ſee in the *Seal* and *Otter*, that thoſe two Amphibious Quadrupeds have no external Ear further protuberant than the other parts of their Head; for had it been otherwiſe, their ſwimming and diving would have been much hindred: But its two ſides are ſo collaps'd, that no Water can enter in when in the Deep, tho' it can receive ſufficient Air when aſhoar. The cellulous Cavity of the *Tympanum* in the Elephant, may well be compar'd to the *Apophyſis Maſtoides* in Man; and the ſecond Cavity of a plain Surface ſeems to be Analogous to the Cavous *Maſtoides* in Sheep, Cats, Dogs, *&c.* So that we ſee that whereas other Animals have but one Cavity for aſſiſting the Vibration of the Air, and Continuation of the Sound in the *Tympanum*; this Animal has two, or a large one with two different Surfaces. The Aqueduct both by its Figure and Poſition in this Animal doth plainly ſhew us the uſe of it in other Animals, which is to receive the ſuperfluous Humours in the *Tympanum*, and convey them to be diſcharg'd in the Mouth.

Explication of the Figures. Plate 12.

Fig. 1. Repreſents the Bony Part of the *Meatus Auditorius* of the right Ear. *a* The external Orifice of the *Meatus Auditorius.* *b* The *Proceſſus Petroſus.* *c* The Orifice where the *Nervus Auditorius* enters. *d* The *Meatus Auditorius.* *e* A part of the *Laminæ* which proceed from it on each ſide, by which the *Cellules* betwixt the two Tables of the Scull are form'd; thoſe ſituated above the *Meatus* being remov'd. *f* Part of the inner Table of the Scull.

Fig. 2. Repreſents part of the *Meatus Auditorius* opened, with other parts of the inner Ear. *a* The ragged part of the Bone, from whence the *Os Petroſum* was ſeparated. *b* The *Proceſſus Petroſus* opened. *c* The *Crena* for the *Membrana Tympani.* *d* The Hony-comb Cavity of the *Tympanum.* *e* Its inner Cavity of a ſmooth Surface. *f* Its Semicircular or undulated Lines. *g* The Orifice of the Aqueduct. *h* The Orifice of the hard Portion of the Nerve.

Fig. 3. Repreſents the lower Surface of the *Os Petroſum*, as it was ſeparated from above the *Tympanum* and other parts of the inner Ear. *a a* The ragged Margin of the Bone. *b b* The upper part of the *Cavitas Tympani.* *c* The *Foramen Ovale.* *d* The Protuberance in which the *Labyrinth* and *Cochlea* are lodg'd. *e* The Orifice of the hard Portion of the *Nervus Audisorius.*

Fig. 4. Repreſents the *Malleolus* alone in its true Dimenſions. 1. The Protuberant Head. 2 The Semicircular *Sinus* betwixt it and the Margin. 3 The *Sinus* which receives the Head of the *Incus*. 4 The Angle below the *Sinus* for the Head of the *Incus*. 5 The Angle where the *Manubrium Malleoli* begins. 6 The *Manubrium Malleoli*.

Fig. 5. Repreſents the *Incus*. 1 The Head of the *Incus*. 2 The *Sinus* or Neck of the *Incus*. 3 Two *Apophyſes*. 4 A long Protuberance with the *Sinus* for the *Os quadrangulare* at its Extremity.

Fig. 6. Repreſents the *Stapes*. 1 The ſmall part of the *Stapes*, where it is articulated with the *Incus*, with a *Sinus* at its Extremity, being the other half of the Cavity of the *Os quadrangulare*. 2 2 Two ſmall Portions of the *Stapes*, where it is articulated with the *Baſis*. 3 The *Baſis* of the *Stapes* ſeparated. 4 The whole *Stapes*.

Fig. 7. The *Malleolus* and *Incus* join'd together, with their lower ſide turn'd up. 1 The *Malleolus*. 2 Its Articulation with the *Incus*. 3 The *Incus*. 4 The *Manubrium Malleoli*. 5 A Point of the *Incus*, fram'd by the other two Productions. 6 The long Protuberance of the *Incus*. 7 The *Sinus* in the Extremity of its long Production.

Fig. 8. The *Malleolus*, *Incus* and *Stapes* articulated together. 1 The *Incus*. 2 The *Malleolus*. 3 The *Stapes* where it ſhuts the *Foramen Ovale*.

Fig. 9. Repreſents the upper part of the *Lineæ Semilunares*, or that ſide which is towards the paſſage of the *Nervus Auditorius*. *a* The five Extremities cut off. *b* The *Linea Semilunaris Major*. *c* The *Semilunaris Media*. *d* The *Minor*. *e* The common Canule between the *Major* and *Media*.

Fig. 10. Repreſents the *Cochlea* and *Labyrinth* together. *a* The *Veſtibulum*. *b* The *Foramen Ovale*. *c* The *Foramen Oblongum*. *d* The *Linea Semilunaris Minor*, which is towards the *Cavitas Tympani*. *e* The common Canule to the *Major* and *Media*. *f* The *Major*. *g* The *Media*. *h* The *Cochlea*.

Fig. 11. Repreſents the *Cochlea*. *a* The *Veſtibulum*. *b* The third *Gyre* or turning. *c* The Orifice. *d* The firſt *Gyre* or turning opened. *e* The ſecond turning. *g* The Orifice at the top of the *Cochlea*.

Of the Opoſſum. *by Dr.* Tyſon, *n*.290. *p*. 1565 * *Phil. Tranſ. n*. 239. *Abridg* Vol. I. *p*. 881.

III. I ſhall beg leave to obſerve ſome few things, that may tend to the illuſtrating the Hiſtory of this Animal, omitted in the Anatomy of the *Female Opoſſum*, lately * printed.

And in the firſt Place, whereas I there queried to what Species in the Prædicament of Animals this Creature might properly be reduced? Now having upon the Diſſection obſerved the *Penis* to be fleſhy, and to have no Bone in it; I find it cannot be referred to the Dog or Weaſel kind, as ſome have thought. However every little Help will contribute ſomewhat.

To give therefore my Thoughts on this Subject, I ſhall here propoſe a Diviſion of ſuch Terreſtrial Animals as have many divided Claws and Nails at the end of them into

Animalia
- Χειρο-δάκτυλα *ſeu Manu-digitata, i. e.* whoſe Feet reſemble Hands, and have Fingers rather than Toes.
- Ποδο-δάκτυλα *ſeu Pede-digitata*, i. e. whoſe *digiti*, from the order of their Poſition and Shortneſs as alſo Uſes, more reſemble Toes than Fingers.

Animalia Χειρο-δάκτυλα, *Quorum*,

Pedes
- *omnes ſunt Manu-formes, ſeu Animalia Quadru-mana:*
  - *cum Pollice in omni Pede ſc.*
    - Simia
      - *Caudata.*
      - *Non Caudata.*
    - Romack.
    - Coati *Braſil.*
    - *&c.*
  - *Sine Pollice in Pedibus*
    - *Anterioribus*
      - Vantrevan.
      - Sciurus.
      - Mus, *&c.*
    - *Poſterioribus*
      - *Genus Felinum.*
- *Duo tantum ſunt Manu-formes, ſc. vel*
  - *Anteriores*
    - *Cum Pollice*
      - Mantegar,
      - *&c.*
    - *Sine Pollice.*
      - Cuandu *Braſil. Margravii.*
      - Tlaquatzin *Spinoſum Hernandez.*
      - Hyſtrix.
      - Tamandua *Braſil.*
      - *&c.*
  - *Poſteriores*
    - *Cum Pollice*
      - Carigueya. *S. Opoſſum,*
      - *&c.*
    - *Sine Pollice.*

Under the firſt Member of this Diviſion I include the Ape and Monkey kind, which as I have ſhown in my Diſcourſe of the *Ourang Outang*, ought rather to be reckon'd a Four-handed than a Four-footed Animal. And conſidering how large a Species of Animals may be reduced under this *Quadrumanous* kind, agreeing in this Particular, tho' in others different, I think it but juſt to aſſign them a general *Claſſis*, afterwards to be ſubdivided according to the gradual Differences they have from one another. The *Romack* therefore, though in the Head and Face much different from the Monkey kind, yet being *Quadrumanous*, and on each Hand having a Thumb, I reduce under this Head. This Animal was brought alive from *Fort St. George*. Whether it is deſcrib'd by any, or what other Names 'tis call'd by, I do not know. And becauſe in its Face and Head it ſo much reſembles a Fox, and in the reſt of its Body a Monkey, for the preſent ſhall call it Ἀλωπιπίθηκος, *Vulpi-Simia*, or the Fox Monkey. But the next I have mentioned in this Claſs, the *Coati* of *Braſil* and *Virginia*, or the *Rackoon* or *Rattoon*, though in its Body it does not reſemble the Monkey kind, yet becauſe it has Hands, like a Monkey, as *Margrave* tells us, I place likewiſe here; as may be all others, whoſe Feet are all formed like Hands, and have a Thumb in each.

For there are ſome that have not a Thumb on their Fore feet, and others that want one on the hinder. In the number of the former may be reckoned the *Vantrevan*, the Squirrel kind and Mouſe kind, or any others that may be obſerved to have all their Feet formed like Hands, only on their Fore-feet do want a Thumb. The *Vantrevan* (as 'twas called by the Perſon that ſhewed it here in *London*) altogether reſembles a Monkey, which on the Fore feet had only four long Fingers and no Thumb. 'Tis a beautiful Creature, very briſk and nimble in Motion and loving; has a very long Tail, by which it ſuſpends its Body, as does the *Opoſſum*. The Squirrel kind on the fore Feet have four long Fingers, on the hinder five, and one like a Thumb. It makes uſe of the fore Feet like Hands, in holding up its Food to its Mouth, and lives on Trees, as do the Monkeys. But the Affinity between the Monkey and Squirrel kind does better appear by ſome Monkeys I have ſeen, which on the Belly have a large thick Furr, and a thick bruſhy Tail like the Squirrel, whereas uſually on the Belly the Ape and Monkey are thinner of Hair, and that on their Tail is ſhorter. This ſort of Monkey I call therefore the Squirrel Monkey or *Sciuro-Pithecus*, and have made a Figure of one of them. But its Face more reſembled a Man's or an Ape's, likewiſe its Teeth, and in theſe reſpects is much different from the Squirrel kind. Nearer to the Squirrel comes the Mouſe kind, which in the Shape of its Head, the long Teeth before, and the large and prominent Eyes more reſembles the Squirrel kind, and makes uſe of its fore Feet as Hands, in feeding its ſelf, where it has only four Fingers without a Thumb, but on its hinder has five, of which the inwardmoſt and outwardmoſt are placed at a diſtance from the Range of the three middle Fingers, like two Thumbs, as may be obſerved in ſome of the Lizzard kind. Why we ſhould include the Cat kind in the number of the *Animalia* Χειρο-δάκτυλα ſome may queſtion, ſince their Feet ſeem rounder, and to have rather Toes, than Fingers. But we may obſerve that it uſes its fore-Feet like Hands in climbing and catching its Prey ; and when it does ſo, it exerts its Claws and lengthens them ; but when it uſes its Feet in going and running it ſhortens them, that being moſt convenient for that purpoſe, ſo that 'tis well provided for both, and its *Digiti* are of a middle Nature between Fingers and Toes, as they are lengthened or ſhortned. And we may obſerve on each fore Foot there is a *Pollex* or Thumb ſet at a Diſtance from the Range of the other Claws whereby they more reſemble Hands, and on the hinder Feet there are only four *Digiti* without a Thumb.

We come next to thoſe Animals that have only two Feet formed like Hands, and thoſe are either the fore Feet, or the hinder.

Thoſe whoſe fore Feet only are formed like Hands, have either a Thumb there, as the *Mantegar*, *&c.* or have only four Fingers without a Thumb, as the *Cuandu*, &c.

The *Mantegar* is an Animal not deſcribed as I know of by any Author, and the ſtrangeſt that I have ſeen. It is about the bigneſs of a Maſtiff Dog; it meaſured from the end of its Noſe to the *Anus* three Foot 2 Inches; the Girth of the Body 2 Foot 2 Inches; the Head 14 Inches long; the Forehead 5 Inches broad; the Head ſomewhat reſembles an Horſe's; the Noſtrils large ; the Noſe of a deep Cinnabar Colour, and the Bones of the Noſe depreſſed lower than thoſe of the Upper Jaw, where the Skin was an of Azure blew Colour; a large Tuft of Hair on the Forehead and likewiſe under the Chin; the fore part of the Body and inſide of the Arms and Legs almoſt bare of Hair, the Hair on the outſide of them, of a mottle brown and olive Colour; on the Back blackiſh: There were *Mammæ* on the Breaſt; an *Umbilicus*; and the *Præputium* without a *Frænum*, as in the Ape kind; the *Præputium* of a Vermilion Colour; the *Scrotum* of an Azure; it had no Tail; 'tis very fierce, having two long Tusks in the Upper Jaw, and very laſcivious; the fore Feet perfectly reſemble Hands, having long and thick Fingers and a Thumb, and all the Nails of thoſe Fingers flat; the Nails on the hinder Toes and Fingers imbricated, not flat; and though the Claws were pretty long, and ſomewhat imitating Fingers, yet the Thumb not ſo perfect, and the whole different from the fore Feet. When ſitting and ſupporting its ſelf by a Stick in one Head, being thus erect, and holding a Cup in the other, it would drink out of it, and not lap; its Food was chiefly Fruits.

Amongſt thoſe Animals whoſe fore Feet are like Hands, and have no Thumb, I reckon the Porcupine kind, as the *Cuandu* of *Braſil*, a ſort of Porcupine deſcribed by *Margrave* and *Jo. Nieuhoff* (*Voyages* pag. 18) which on the Fore-feet hath but 4 Fingers, on the hinder 5. Therefore as *Margrave* obſerves, for want of a Thumb, it is but ſlow in climbing Trees; but the better to help himſelf, it twiſts its Tail about a Bough, to ſave its ſelf from falling. And much alike, if not the ſame, is the *Tlaquatzin Spinoſum* of *Hernandez.* So the Common Porcupine, before has 4 Fingers, behind 5. So the *Tamandua* of *Braſil*, or *Ant-Bear*, before has but 4 Fingers, where the want of length in the Fingers is ſupplied by that of the Nails, and behind has 5 Toes. But I muſt confeſs there muſt be ſome Allowance made, for ranging this *Anomalous* Animal (as Mr *Ray* calls it) here. But becauſe he climbs Trees, and in doing this makes uſe of his Tail, as ſome others here mentioned do, I was willing to put him into the Croud. And, unleſs it can be otherwiſe better ranged, we may likewiſe ſhuffle in here the *Ai*, *Ignavus*, or Sloth, becauſe it climbs, and lives on Trees, and has a Head not unlike an Ape's; and, as *Margrave* aſſures us, two Teats on the Breaſt, but on each Foot had but three Claws, with very long Nails, like the *Tamandua*, and its Feet being very narrow and thus defective in Toes, 'tis very ſlow in Motion.

Amongſt the Animals whoſe hinder Feet only are like Hands, is to be reckon'd the *Carigueya* or *Opoſſum*; and if there be any other Animals that have their hinder Feet formed like Hands, either with or without a Thumb; they may be reduced hither, my chief Deſign in this Scheme being (as near as I could) to include all thoſe Animals that are obſerved to climb or live on Trees, into a Claſs together; and they being obſerved to have their Claws, either all or many of them, formed like Fingers, I place them therefore under this general Title of *Animalia* Χειρο δάκτυλα.

Now begging pardon for this Digreſſion, we ſhall proceed in our Obſervations on the Male *Opoſſum*.

In deſcribing the Ears of which, I had not an opportunity of obſerving that white *Rimm* that incircles them, which is very beautiful: for when in Health, for the breadth of two lines or more, there runs an Edging round the Verge of the Ear of a perfect Milk white Colour. But the Ear here being ſo very thin and tender, 'tis eaſily affected by cold or illneſs, and then this white part becomes jagged and crimpled, as if burnt up, and the whiteneſs diſappears; as it happened in this laſt ſubject before his death, as well as the firſt, which occaſioned my not obſerving it then. 'Tis on this account that *Margrave* in his Deſcription of the *Tai-ibi* of *Braſile*, which now I take to be the Male *Opoſſum*, ſaith, it has *Aures ſubrotundas, molles, graciles, albas, teneras, ut Charta molles*, not that the whole Ear was White, but only the Edges. But what I was moſt deſirous to know, was whether the Male had that *Marſupium* or Pouch for receiving the Young, as is affirmed by ſome. Mr. *Cowper* in the Subject he diſſected, neither obſerved the Pouch nor the Muſcles belonging to it, as has been deſcribed in the Female: Nor indeed did I in that I diſſected. Only this I took notice of when firſt I had it; that the Skin here ſeemed to be looſer; ſo that with my finger

ger I could eaſily thruſt it in, and by turning it round, could form for the preſent a Pouch; but this would eaſily turn out again, upon withdrawing my fingers. Whether therefore 'tis capable of being formed into a Pouch or *Marſupium* upon occaſion, I ſhall leave as a Quæry to be reſolved by thoſe that live where they breed, Whether they ever obſerve the Male to receive the Young ones as do the Females? However, in the Male there were thoſe Bones I call *Marſupialia*, and I obſerved Muſcles running from them to the hinder Legs, which, no doubt, are very ſerviceable to them in drawing up their Bodies, as I find Mr *Cowper* has likewiſe remarked.

I ſhall conclude this Paper with ſome few remarks I made upon the Brain, where I obſerved that being taken out of the *Cranium* it weighed two drams two ſcruples. I did not find either in the *Cerebrum*, thoſe *Anfractus*; or in the *Cerebellum* thoſe *Circilli* which we uſually meet with in other Brains. The whole was of an Oblong figure, and ſeemed to be divided into three Parts, *i. e.* The *Cerebellum*, the *Cerebrum*, and that part of the *Cerebrum* which was projected into the *Roſtrum*. For by the Pinching in of the *Cranium* here, the fore part of the *Cerebrum*, from whence iſſued the *Proceſſus Mamillares* and *Olfactory* Nerves, was by this Conſtriction, remarkably diſtinguiſhed from the *Cerebrum*; like an *Anterior* Brain. In the Vermin kind, and thoſe that have a long *Roſtrum*, I have obſerved the like. For Nature here ſeems to give them more particularly the advantage of the Senſe of Smelling, for finding out their Prey, or avoiding the Danger they would ſhun.

So likewiſe I obſerved the Optick Nerve, as likewiſe the Eye to be large; the better to look out for the one, or the other. And when I have mentioned the Auditory Nerves to be large likewiſe for the ſame reaſon, to give them a quick ſenſe of hearing any ſudden Noiſe, and ſo to avoid the Danger, theſe were the greateſt Remarks I made upon the Nerves. It was obſerved that it ſaw beſt in the twilight, and not ſo well in the bright Sun; which I was eaſily brought to believe, becauſe it was then to ſeek out for its Prey. In the Eye I obſerved the *Membrana Nictitans*; The *Glandula Lachrymalis* was large and oblong; there was the *Muſculus ſeptimus ſuſpenſorius*; and the *Cryſtalline* Humour was large, very tranſparent and almoſt of a globular figure; the Eye or *Iris* black.

IV. This Male *Opoſſum*, was brought from *Virginia* and preſented to the *Royal Society*, by *William Bird* Eſq; and was alſo kept alive in their Repoſitory; but falling from its meat (like that you examin'd I gueſs) it languiſhed and dyed: The cauſe of its Death appeared to be from a Mortification of the *Duodenum* immediately below the *Pylorus*, which ſeemed to ariſe from a quantity of Hay, that had been collected in the Stomach, and matted together in the ſhape you have deſcribed, and figured the * hairy *Tophus* you found in the Stomach of that you diſſected, but I could not find any hair in this; this wad of hay ſlipping out of the

Anatomy of the ſame. by Mr. Cowper. *ib. p.* 1576.

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* Phil. Tranſ. n. 239. Tab. 2. Fig. 4 Abr. Vol. II. Fig. 256.

the Stomach ſtuck in the *Duodenum*, which together with the viſcid matter that involved it, compleatly obſtructed the Paſſage in that Gut, as well as that of the Gall into the Gut, which appeared from the Diſtention of the Liver as well as fullneſs of the Gall Bladder. The *Omentum*, which in this Creature is only faſtened to the bottom of the Stomach, had alſo ſuffered a Gangreen, as had almoſt the whole Canal of the Guts: but of this by the by, my deſign being only to give you an account (ſuch as it is) of thoſe Parts of the Male, which diſtinguiſh it from the Female.

Beſides the Organs imploy'd in Generation, the Male *Opoſſum* differs externally from the Female, there being no *Marſupium* or Pouch to receive the young ones, which you have given ſo exact a deſcription of; nor are there any Muſcles inſerted to the Skin of the *Abdomen* ſpringing from the *Oſſa Marſupialia*, as you call the Bones, which may deſerve the Name of *Hyoides*, from the figure they make with the *Oſſa Pubis* of this Animal; which Bones do not ſeem to differ in the Male, from thoſe of the Female you have deſcribed and figured in the Tranſactions abovementioned.

Plate 13. *Fig.* 1. There is no external appearance of Genitals in the Male *Opoſſum* but the *Scrotum*; which is but juſt big enough to contain the *Teſtes*; nor could I readily diſcover any other *Foramen* outwardly in theſe parts but the *Anus*, *A.* which leads to the *Rectum*; but on withdrawing its ſides, I found another *Foramen*, *B.* which on Diſſection appeared to be the *Præputium* or Out-let of the *Penis*. On compreſſing the parts on each ſide this *Cloaca*, *A. B.* I obſerved two Drops of yellowiſh colour'd Liquor (of the reſemblance of *Pus*) ſtart out on each ſide the *Anus*, *c. c.* which on further examination I found come from two glandulous Bodies or Bags placed on the Sphincter Muſcle of this Part. This ſort of Liquor (it ſeems) you found in the Pouch of the Female, which, like this, had more of the peculiar *Fœtor* of this Animal, than any other part beſides; for on removing theſe Parts with the Skin about the *Cloaca*, I was freed from the ungrateful Smell of it. On ſeparating the Skin from the Muſcles of the *Abdomen*, the two above-mentioned Bones (peculiar, I believe, to this Animal) appeared, from whence ſome Muſcles ſprang, and were inſerted to the *Oſſa Femorum*, which performed the Office of the *Pſoas* Muſcles in other Animals, which laſt named Muſcles were much ſmaller in this than in other Creatures.

The *Abdominal* Muſcles were alſo faſtened to the laſt mentioned Bones, particularly the *Recti*, which enabled this Creature to project or ſpring its Body, eſpecially in pulling its hind Legs forward, with more advantage or force than other Animals, which are without theſe Bones. Immediately under the Skin about the *Cloaca*, I found a thin fleſhy Muſcle, incloſing the *Præputium*, and lower parts of the *Rectum*
Fig. 2. 3. and *Odoriferous* Bags, together with the four *Mucous* Glands, *M M N N* at the roof of the *Penis*, and body of the *Penis* it ſelf *A*; all which parts were liable to be compreſt by the Action of this Muſcle, eſpecially when

when the *Penis* is erected, whereby its Erection is ſuſtained, by compreſſing the two external Veins on the *Dorſum Penis*, of which more hereafter, when I come to ſpeak of the manner the *Penis* of this Animal is erected. On removing this thin broad Sphincter Muſcle, I was obliged to clear away two Lumps of hard Fat before the Body of the *Penis* could be diſcovered; but we ſhall leave theſe Parts till we have cleared the *Teſtes*.

The *Scrotum* being remov'd, each Teſticle appear'd as repreſented on the left ſide *QTV*, the *Vaſa præparantia* and *Deferentia* QQ being Fig 2. incloſed in the Cremaſter Muſcles, *PP*. Theſe Muſcles were proportionably very large in this Animal, as I have always obſerv'd them in Creatures, that have no *Veſiculæ Seminales*, which is the Caſe of this Animal, and this Proviſion of Nature ſeems not only neceſſary to ſuſpend the *Teſtes*, but theſe incloſing Cremaſter Muſcles alſo compreſs the *Epididymides* and *Vaſa Deferentia*, and oblige them to diſpatch their Contents (the *Semen*) into the *Urethra* in the time of the Coition, which otherwiſe would have a ſlow progreſs; but this contrivance appears more peculiarly requiſite in this Creature, becauſe the defect of the *Veſiculæ Seminales* here, ſeems to be ſupplied by the largeneſs of the *Epididymides* of the *Teſtes* WW which are the excretory Ducts of Fig. 2, 3. the *Teſtes*, and appear in this Animal to have a larger Bore than ordinary: For this reaſon the *Tunicæ Vaginales* are very ſtreight in this Animal, as appears in the Figure *TVRR*. Fig. 2.

On diſcovering the Originations of the Spermatick Arteries, I was ſurpriz'd to meet with an appearance I never heard of nor obſerved before; and in this I ſhould not have had any ſatisfaction, if I had not firſt injected Wax into the Trunks of the great Artery *iii* and *Vena* Fig. 2. *Cava* h below the Diaphragm. It ſeems the deſcending Trunk of the great Artery, below the emulgent Arteries in this Creature, is placed directly under the Trunk of the *Vena Cava*, nor do the Iliack Branches of the Arteries here, twine about thoſe of the Veins, as in Human Bodies and ſome Quadrupeds, which is done perhaps to compreſs the Channels of the Veins, by means of the Pulſation of theſe Arteries to drive up the Blood in the Veins towards the Heart; but that contrivance ſeems no way neceſſary in this Animal, becauſe the contrary poſition of its Body is more cuſtomary in hanging by its Tail with its Head downwards: It is not unlikely, if the Veins of this Animal were examined below the Heart (which indeed I did not think of till thoſe Parts were thrown away) but we ſhould meet with ſome Contrivance to prevent the Precipitate Flux of the Blood in that Pendulous Poſition, as I have obſerv'd in the Trunk of the *Cava* immediately above the Liver in Dogs. But to return to the Spermatick Veſſels.

The Arteries *a a* ariſe from the forepart of the Deſcending Trunk of the great Artery, and paſs through a very ſmall Perforation * . . . . . . made on purpoſe in the *Vena Cava*, and deſcend ſtraight to the *Teſtes*, as in Human Bodies, and are not contorted in their progreſs, as we find them in moſt, if not in all Quadrupeds. This Perforation of the *Cava* perhaps was not only made for tranſmitting the Spermatick Arteries, but may alſo frame an *Annulus*, that may check the Velocity the Blood would otherwiſe have in thoſe Arteries, which rapid Motion of the Blood we find Nature ſtudiouſly avoids in the *Teſtes* of all Animals: For in Men we ſee theſe Spermatick Arteries (contrary to all other Trunks of Arteries) are leſs at their Originations from the Great Artery; and in Quadrupeds (except in this) the Spermatick Arteries are contorted before they reach the *Teſtes*, as I have (*a*) elſewhere taken notice. The Spermatick Veins, after leaving the *Teſtes* of this Animal (like thoſe of Humane Bodies) have ſeveral Diviſions and Inoſculations, which are all reduced to one Trunk on each ſide, and empty themſelves into the *Cava* immediately above the Perforation *b b*.

(*a*) Phil.Tranſ. n.280.p. 1180. v. ſupra. Part II. p.125.

Fig. 2.

Fig. 2, 3.

Had the known Structure of the *Teſtes*, in relation to their Excretory Ducts, been left undiſcovered till now, the bare Inſpection of thoſe parts in this Animal would inſtruct us: for on dividing the *Tunica Vaginalis* (*R R*) I found the incloſed Teſticle and its *Epididymis* lying looſe, inſomuch that they parted from each other as expreſt *W X Y Z*, and with the Aſſiſtance of a pretty large Convex Glaſs I could ſee the *Excretory Duct Z* ariſing from one end of the Teſticle, where the Spermatick Artery and Vein *Y* may be ſeen: After that Duct has marcht a little way, it may be ſeen folded up into the Body call'd *Epididymis W W*, and at length makes the *Vas Deferens S S*. You know in Men, and moſt, if not in all Quadrupeds, the *Epididymides* and *Teſticles* cleave ſo to each other, that without ſome Dexterity in Diſſection the riſe of them from the *Teſtes* is not to be diſcovered. This proves to us the uſe of Comparative Anatomy in detecting the Structure of parts which is very obſcure in other Subjects as well as in Humane Bodies; but to return to the *Vaſa Deferentia S S.* after they leave the *Præparantia a b*, as in Men and other Creatures, they grow ſomewhat larger, but on croſſing the Ureters *e e* become leſs again at their Entrance into the *Urethra*, immediately below the Neck of the Bladder; where their Orifices could be perceived on each ſide a Caruncle: Nor are there any *Veſiculæ Seminales* near the *Vaſa Deferentia* of this Animal, as in Boars, Bulls, Horſes, *&c.* which nevertheleſs cannot be allowed to communicate with each other as in Men; for tho the *Vaſa Deferentia* and *Veſiculæ Seminales* of thoſe laſt mentioned Animals empty themſelves into the *Urethra* at the ſame Orifices with the *Veſiculæ Seminales*, yet their communicant Ducts are ſo very ſhort, that whatever comes by the *Vaſa Deferentia* will ſooner eſcape into the *Urethra*, than be received by the *Veſiculæ*, as in Men.

Fig. 1.

The length of the *Urethra* between the Bladder and the *Penis* exceeded 4 Inches, more than 3 Inches and an half of which was incloſed with a Glandulous Body, analogous to the *Proſtates* in Men and other Creatures; the Orifices of the Secretory Ducts of this Glandulous

Body are very numerous, and open into the *Urethra* on all ſides, as appear'd on opening the *Urethra*, and compreſſing this Glandulous Body or *Proſtatæ*, I ſaw its ſecreted Juice ſtart out.

This part of the *Urethra IKKL* thus incloſed with the *Proſtates*, Fig. 2, 3. being very much contorted or folded, in its Natural Situation between the Bladder and the *Penis*, when there is no Erection, muſt neceſſarily be drawn out, and becomes ſtraight when the *Penis* is extruded (which I ſhall ſhew by and by happens upon an Erection) by which means this Glandulous Body is neceſſarily compreſt, and the *Succus Proſtatarum* forced into the *Urethra*. The *Proſtatæ* of divers Animals are compreſt by Muſcles fram'd on purpoſe that incloſe them, as in Boars, Rams, *&c.* in Men they are compreſt by the *Muſculi Levatores Ani*.

At the Root of the *Penis* of the *Opoſſum* we meet with four Glandulous *Veſiculæ MMNN* two on each ſide, which empty themſelves into the *Urethra*, and contain a mucous Matter, like that I find in the Glands I lately diſcover'd in this part in Men. Theſe *Veſiculæ* are not only compreſt by the thin broad Sphincter Muſcle above mentioned, but the Bulbs of the Cavernous Bodies of the *Penis CC*, and *Urethra EE*, when diſtended (in the Erection of the *Penis*) alſo compreſs theſe mucous Bags. This Compreſſion is effected in Men by the Intumeſcence of the Bulb of the Cavernous Body of the *Urethra*. In Boars, Rams, Cats, *&c.* we find Nature ſo ſollicitous to diſcharge the Contents of the Excretory Ducts of theſe Glands, that (like the Gizzard of Birds) each Mucous Gland is incloſed with a proper Muſcle to compreſs it.

The *Penis* fell next under my Examination, the Fabrick of which appears not leſs ſurprizing, than that you met with in the *Uterus* of the Female; and in many Circumſtances differ'd from what I have found in Animals I have hitherto diſſected: Beſides the forked Glans of its *Penis BB.* its Cavernous Bodies *DD.* had no Connection with the Fig. 2, 3. *Oſſa Pubis*, nor did the Muſcles call'd *Erectores* or *Directores CC* cleave to any Bone as in Men and Quadrupeds, but all thoſe parts lay looſe under the *Oſſa Pubis*. The other Extremities of the two *Corpora Cavernoſa Penis* are received into the Glans. Nor did the *Corpus Cavernoſum Urethræ e* or its Muſcles *EE* cleave to the *Sphincter Ani*, as in moſt other Creatures. But the whole Body of the *Penis* lay looſe between the Bones of the *Pubis* and the *Rectum*, ſo that on the Intumeſcence or E- Fig. 3. rection of the *Penis*, it is at liberty to be extruded from its *Præputium*, wherein it is ſecured from outward Injuries when not erected. To favour this Extruſion of the *Penis* in this Animal, the *Urethra IKL* is not only very long between it and the Bladder *OO*, but I found it much more contorted or folded in acuter Angles, than is expreſt in the Fi- Fig. 2. gures, elſe the *Penis* could not be extruded, but the Bladder *OO* muſt follow it. Beſides it appears, Nature deſign'd this Extruſion of the *Penis* of this Animal in its Erection, becauſe we meet with Inſtruments to withdraw it again into the *Præputium*. *ff G* ſhews a pair of Muſcles elegantly framed for that purpoſe on the fore part of the *Penis*; the arise fleſhy from the *Corpora Cavernoſa Penis* D D, and becoming tendinous *ff*, as they paſs through two Ligaments or Pulleys on the *Oſſ Pubis*, and are afterwards united into one Tendon G, which is inſerted to the upper part or *Dorſum Penis*. Beſides this pair of Muſcles, (which is peculiar perhaps to this Animal) I found another pair of Muſcles *H H*, that alſo withdraw the *Penis* ariſing from the *Rectum*, and are in- Fig. 2, 3. ſerted to the Extremities of the *Corpora Cavernoſa Penis*: In Cats, Male Porpeſs, Bulls, Rams and Boars, we meet with two Ligaments ſpringing from the *Os Sacrum* or *Ilium* on each ſide, and inſerted to the *Corpora Cavernoſa Penis* of thoſe Animals, which like theſe Muſcles ſerve to withdraw the *Penis* of thoſe Creatures into the *Præputium*.

The *Corpora Cavernoſa Penis* of the *Opoſſum* differ in their figure from Fig. 2, 3. what we find in other Creatures; their upper parts are bulbous D D, and covered with Muſcles C C like the Bulb of the Cavernous Body of the *Urethra* in Men: In other Animals, thoſe Parts of the *Corpora Cavernoſa Penis* are of a conical Figure. The Muſcles of the Cavernous Bodies of the *Penis* of this Creature having no Connection with the *Os Pubis*, cannot apply the *Dorſum Penis* to the laſt nam'd Bone, and compreſs the Vein of the *Penis*, whereby to retard the Refluent Blood, and cauſe an Erection, as we have obſerved in other Creatures; but ſome large Veins of the *Penis* here, take a different Courſe and paſs through the middle Parts of the Bulb *K K C*, and are only Fig. 4. liable to the Compreſſion made by the Intumeſcence of theſe Muſcles Fig. 2. C C, that incloſe them. But the chief Agent in continuing the Erection of the *Penis* in this Animal, is the Sphincter Muſcle of its *Anus*, or rather *Cloaca*, to which the broad Sphincter Muſcle above-mentioned is continued, and does ſomewhat contribute. When the *Penis* is extruded from the *Cloaca* (which muſt happen when it is erected) the Sphincter of that part neceſſarily embraces it, the like muſt be done by the Sphincter Muſcle of the *Cloaca* of the Female in Coition: On theſe Accounts I apt to think, theſe Creatures are not very quick in that Act. Beſides the Figure of the *Penis*, Fig. 4. ſhews an unfitneſs for its Retraction till there is a Detumeſcence of its Glans *A B*, which perhaps does not happen in theſe till both Male and Female are ſatiated, as in Dogs and other Animals that have Bones in their *Penis*, and have a bulbous Intumeſcence of the Glans in Coition, and no *Veſiculæ Seminales* as in this Animal, and alſo impregnate the Female with more than two or three at a time, as this does.

As this Bulb of the Cavernous Body of the *Urethra* in Man is fram'd for the uſe of the Glans, to keep it ſufficiently diſtended when required, ſo it ſeems it is neceſſary to have two of thoſe Bulbs incloſed Fig. 2. with their particular Muſcles *E E* in this Animal, to maintain the Fig. 4. Turgeſcence of its doubled or forked Glans *A B* when the *Penis* is erected. In this Diſtention of this *Glans Penis* of this Creature, the middle part of the Orifice of the *Urethra* (in which you ſee the Probe

elegantly framed for that purpoſe on the fore part of the *Penis*; they ariſe fleſhy from the *Corpora Cavernoſa Penis D D*, and becoming tendinous *ff*, as they paſs through two Ligaments or Pulleys on the *Os Pubis*, and are afterwards united into one Tendon G, which is inſerted to the upper part or *Dorſum Penis*. Beſides this pair of Muſcles, (which is peculiar perhaps to this Animal) I found another pair of Muſcles
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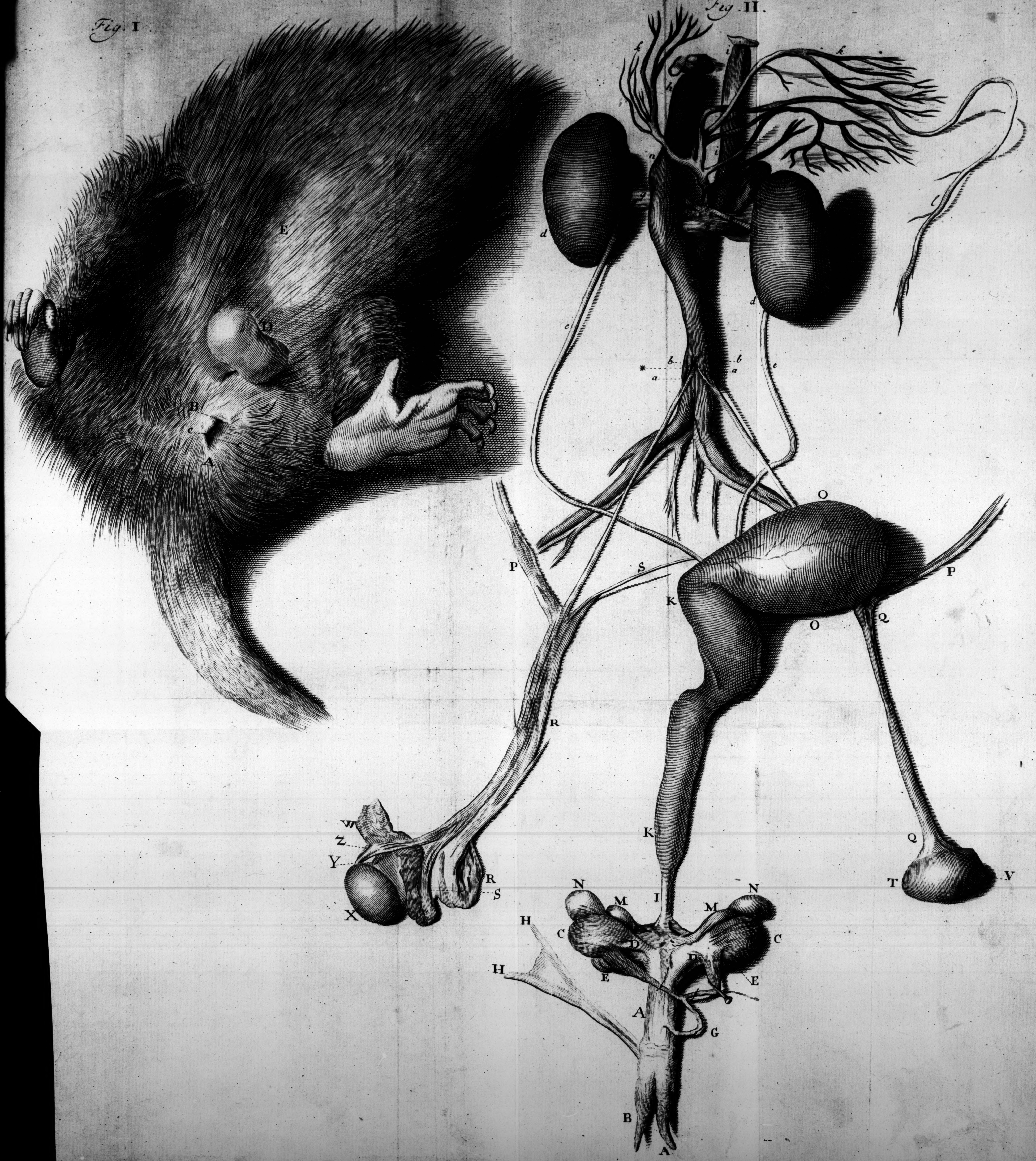
Fig. 2, 3. The *Corpora Cavernoſa Penis* of the *Opoſſum* differ in their figure from what we find in other Creatures; their upper parts are bulbous D D, and covered with Muſcles *C C* like the Bulb of the Cavernous Body of the *Urethra* in Men: In other Animals, thoſe Parts of the *Corpora Cavernoſa Penis* are of a conical Figure. The Muſcles of the Cavernous Bodies of the *Penis* of this Creature having no Connection with the *Os Pubis*, cannot apply the *Dorſum Penis* to the laſt nam'd Bone, and compreſs the Vein of the *Penis*, whereby to retard the Refluent Blood, and cauſe an Erection, as we have obſerved in other Creatures; but ſome large Veins of the *Penis* here, take a different Courſe and paſs through the middle Parts of the Bulb *K K C*, and are only
Fig. 4. liable to the Compreſſion made by the Intumeſcence of theſe Muſcles
Fig. 2. C C, that incloſe them. But the chief Agent in continuing the Erection of the *Penis* in this Animal, is the Sphincter Muſcle of its *Anus*, or rather *Cloaca*, to which the broad Sphincter Muſcle above-mentioned is continued, and does ſomewhat contribute. When the *Penis* is extruded from the *Cloaca* (which muſt happen when it is erected) the Sphincter of that part neceſſarily embraces it, the like muſt be done by the Sphincter Muſcle of the *Cloaca* of the Female in Coition: On theſe Accounts I apt to think, theſe Creatures are not very quick in that Act. Beſides the Figure of the *Penis*, Fig. 4. ſhews an unfitneſs for its Retraction till there is a Detumeſcence of its Glans *A B*, which perhaps does not happen in theſe till both Male and Female are ſatiated, as in Dogs and other Animals that have Bones in their *Penis*, and have a bulbous Intumeſcence of the Glans in Coition, and no *Veſiculæ Seminales* as in this Animal, and alſo impregnate the Female with more than two or three at a time, as this does.

As this Bulb of the Cavernous Body of the *Urethra* in Man is fram'd for the uſe of the Glans, to keep it ſufficiently diſtended when required, ſo it ſeems it is neceſſary to have two of thoſe Bulbs incloſed
Fig. 2. with their particular Muſcles *E E* in this Animal, to maintain the
Fig. 4. Turgeſcence of its doubled or forked Glans *A B* when the *Penis* is erected. In this Diſtention of this *Glans Penis* of this Creature, the middle part of the Orifice of the *Urethra* (in which you ſee the Probe paſſing

Fig. I

Fig. II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paſſing out of Figure 3.) is neceſſarily compreſt, as repreſented Fig. 4. *D*, and two diſtinct Apertures *C C* are left, as appears by the laſt mentioned Figure 4. *A B* on each ſide its forked Glans.

They that fancy an *Aura Seminalis* of the Male paſſes by the way of the Blood of the Female to their *Ovaria* to ſæcundate the *Ova*, will here meet with an Inſtance I muſt leave them to ſolve. For to what end has Nature been at the trouble of making double Emiſſaries for the *Semen* of the Male *Opoſſum*, though ſhe deſign'd the Impregnation of a double *Uterus* of the Female? Certainly one paſſage in the *Glans Penis* would have been ſufficient to convey the *Semen Maſculinum* to the Maſs of the Blood of the Female in the manner they conceive. Nature would never have been at the Trouble of all this Cluter in this Animal, in making a double Glans, and contriving two diſtinct Apertures in the Glans, when the *Penis* is erected, if the Propagation of the Species had not depended on't: Doubtleſs 'twas for that end chiefly, that the *Penis* of this Animal differs ſo much from what we meet with in other Creatures. Nor could the *Penis* of this Animal in theſe Circumſtances, be expos'd in a *Præpuce*, as in other Quadrupeds, by reaſon of the numerous Accidents that would certainly attend it in this Animal's way of living: Nor could its *Penis* have been thus withdrawn when not erected, and ſufficiently extruded when it is, if (as in other Creatures that are retromingent alſo) the *Penis* here had been faſtned to the *Oſſa Pubis*.

Thus we ſee Nature in theſe Inſtances, accompliſh the ſame ends by different Methods. Although there are no *Veſiculæ Seminales* in this Animal, as in Dogs, Weaſels, *&c.* yet we find its *Penis* without a Bone in it, as in thoſe Creatures; but then we meet here with Additional Contrivances to maintain its Erection: Not only the Sphincter Muſcle of the *Cloaca* of the *Male Opoſſum*, but that of the Female alſo cloſely embraces its *Penis* in Coition, and effectually retards the refluent Blood from its *Corpora Cavernoſa*, by compreſſing the Veins of the *Penis* E. Nor could the *Penis* of this Animal be fram'd like that in Boars, Rams, Bulls, *&c.* in whom the *Corpora Cavernoſa* are too large, when not erected, to be ſecured within the *Cloaca* of this Animal.

Fig. 3.

Fig. 4.

The Explanation of the Figures.

Plate 13.

Fig. 1. Shews the external Appearance of the Genitals of the *Male Opoſſum*, ſomewhat leſs than the Life. *A B c c.* The *Anus* or *Cloaca*. *A* its lower Part which leads to the *Rectum*. *B* its upper Part or Orifice of the *Præputium*, whence the Urine and *Penis* is extruded. *c c* Two ſmall Apertures, whence the yellowiſh colour'd Liquor, that had the peculiar *Fœtor* of the Animal had its Exit. *D* The *Scrotum*, juſt large enough to contain the *Teſtes*. *E* That part of the *Abdomen*, where the *Marſupium* is ſeen in the Female, which here appears a little more depreſt than in other Animals, but cannot retain the young ones, as does the Pouch of the Female. *F F* The two Thumbs of the hind Feet or Hands.

Fig. 2.

Plate 13. *Fig.* 2. The fore Parts of the Organs of Generation diſſected from the *Male Opoſſum*; done as big as the Life. *A A* the Body of the *Penis*. *A B* The forked Glans. *C C* The Muſcles Analogous to the *Directores Penis* in Men and other Creatures, which here incloſe the *Bulbi* of the Cavernous Bodies of the *Penis*. *D D* The two *Corpora Cavernoſa Penis*, before they joyn and make the Body of the *Penis*. *E E* Parts of the two Bulbs of the Cavernous Body of the *Urethra*. *G f f* A pair of Muſcles, whoſe two Tendons *f f* paſs through two Ligaments or Pulleys on the *Oſſa Pubis*, and are afterwards united into one Tendon G inſerted to the *Dorſum Penis*, and ſerve to draw the *Penis* within the *Cloaca* after an Erection. *H H* Two other Muſcles which ſerve for the ſame uſe, and ariſe from the *Rectum*, but are fixt to the oppoſite part of the *Corpora Cavernoſa Penis*. *I* The *Urethra* where it has no Glandulous Body incloſing it. *K K* The *Proſtatæ* or *Corpus Glanduloſum*, incloſing the *Urethra*, which lies contorted between the *Penis* and Bladder of Urine in the *Pelvis* of the *Abdomen* of this Animal. *M N* Two Mucous Bags on each ſide, at the Root of the *Penis*, which empty themſelves into the *Urethra*. O O The Bladder of Urine. *P P* The *Muſculi Cremaſteres*. *Q Q* The left *Cremaſter* Muſcle incloſing the *Tunica Vaginalis*. *R R* The *Tunica Vaginalis* of the right ſide, opened to ſhew the incloſed *Vaſa Præparantia* and *Vas Deferens*. *S S* The *Vas Deferens*. *T V* The *Tunica Vaginalis* incloſing the left *Teſticle*, with its *Epididymis V*. *W X Y Z* The right Teſticle, as it appear'd on opening the *Tunica Vaginalis*. *W* Its *Epididymis*. *X* The Body of the Teſticle. *Y* The Spermatick Vein and Artery as they paſs to and from the Teſticle. *Z* The excretory Duct of the Teſticle, which could be diſtinctly ſeen ariſing from the *Teſtes*, and marching to the *Epididymis W*, where it is folded up and conſtitutes that Body, whence it is continu'd to the Bladder of Urine, and call'd *Vas Deferens S S*. *a a* The Spermatick Arteries ariſing from the fore part of the deſcending Trunk of the *Arteria Magna*, where they have a common *Ductus*, which is divided as it paſſes through an Aperture * made on purpoſe in the Trunk of the *Vena Cava*. *b b* The Spermatick Veins at their entrance into the *Cava*. *d d* The Kidneys. *e e* The Ureters. *g g* The emulgent Veins. Ψ Part of the left emulgent Artery. *h* The *Vena Cava* below the Liver. *i i* The deſcending Trunk of the Great Artery. *k k* The Meſenterick Arteries. *l* The lower Meſenterick Artery, which in this Animal does not ariſe from the great Trunk. *m* The left *Glandula Renalis*, that of the right ſide being placed behind the Trunk of the *Vena Cava n*. *o* A common Trunk of an Artery, from whence ſprings the Gaſtrick, the Superior and Inferior Meſenterick, and the Emulgent Arteries of this Animal. The Deſign of Nature in confining all thoſe Arteries to one Trunk in this Animal, might be perhaps in favour of its uſual poſture in hanging by its Tail, with its Head downwards. This Trunk of the Arteries of the *Viſcera* of the lower Belly, having ſo many united Forces, is the leſs liable to any

Fig. IV.

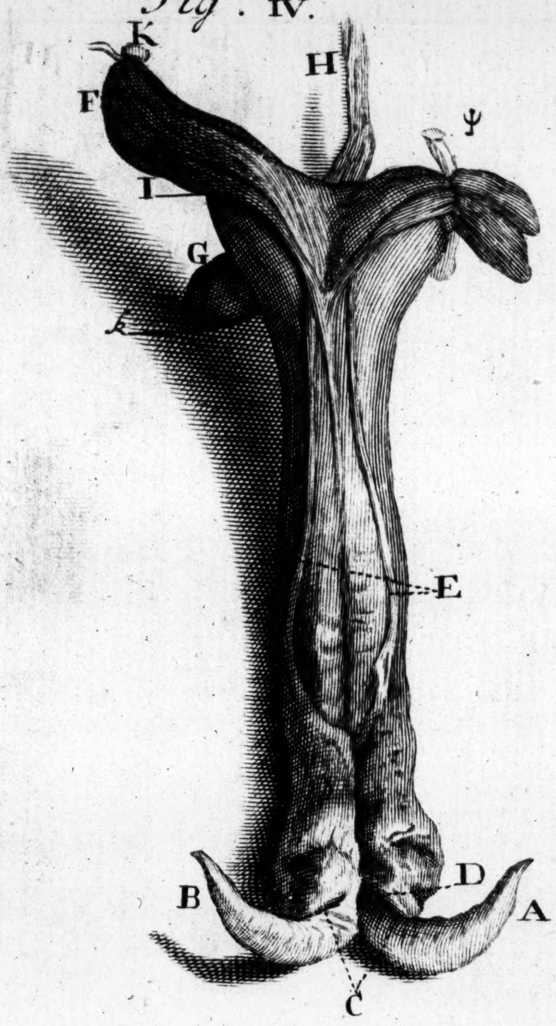
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Fig. III.

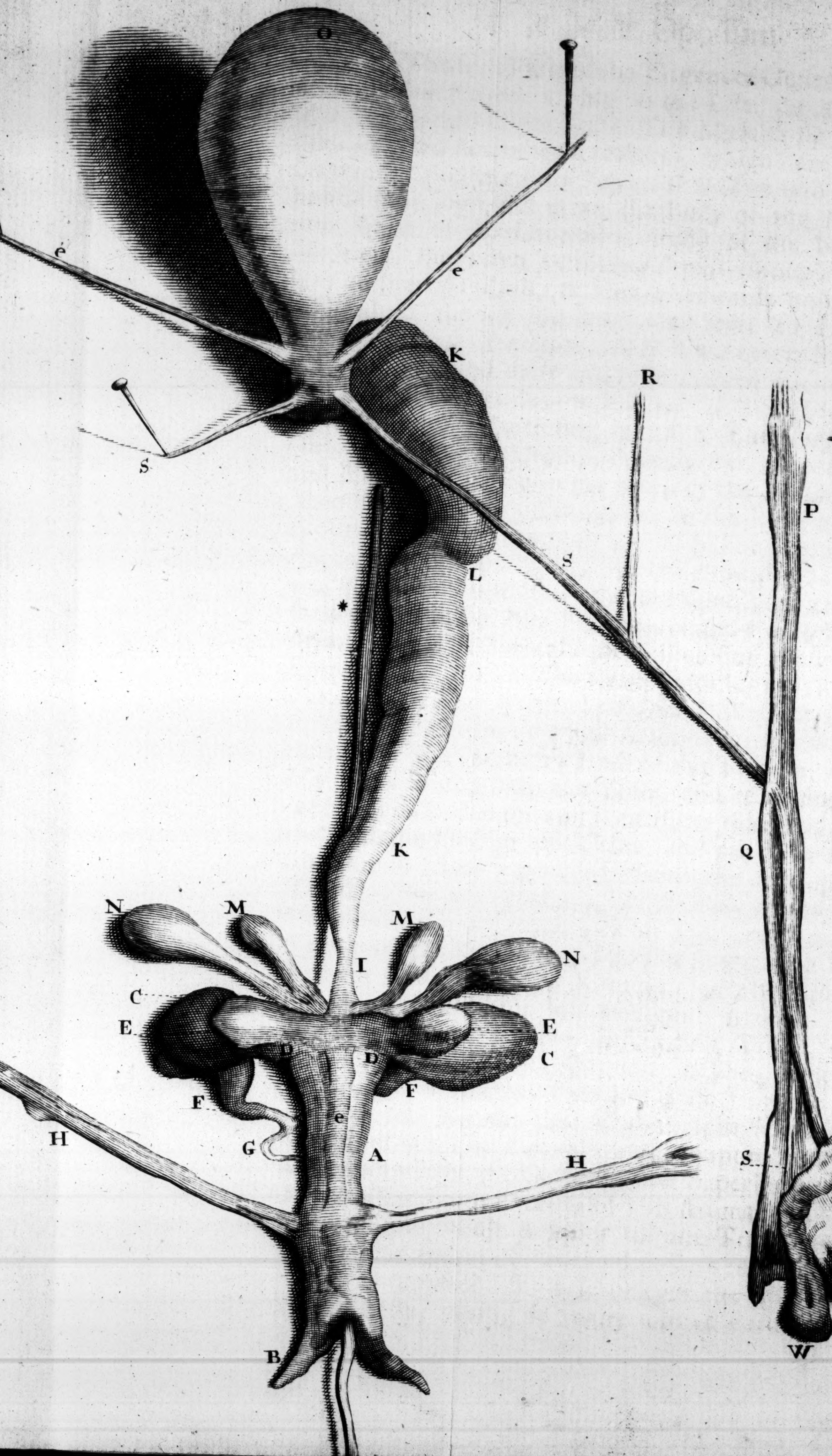
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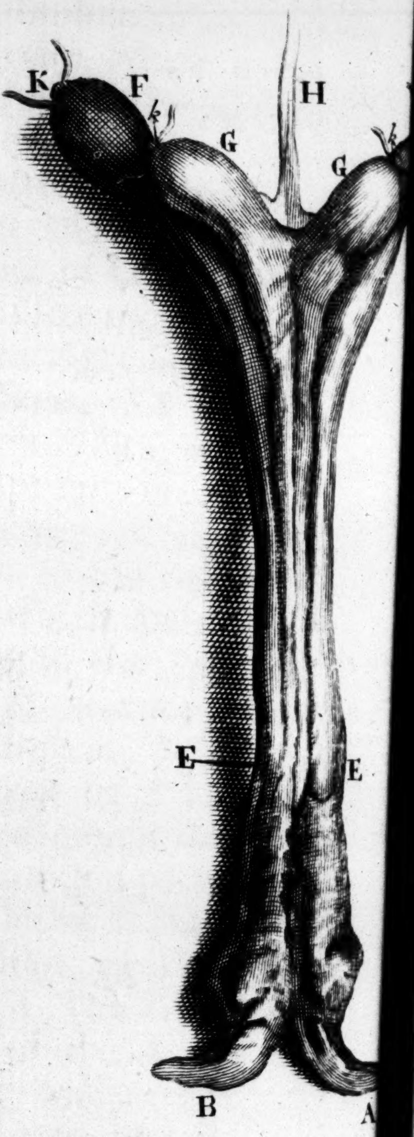
Fig. V.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Compreſſion that might be made by the contain'd Parts of the lower Belly in that Poſture.

Fig. 3. The back ſide of the Genitals of the *Male Opoſſum*. *A* The Body of the *Penis*. *B* Its Glans. *C C* The *Bulbi* of the *Corpora Cavernoſa Penis* covered with their Muſcles. *D D* The *Corpora Cavernoſa Penis*. *E E* .... The two diſtinct *Bulbs* of the Cavernous Body of the *Urethra*, incloſed with their particular Muſcles. *F F G* Parts of the Muſcles expreſt on the fore part of the *Penis* in the preceding Figure. *H H* The other pair of Muſcles ſpringing from the *Rectum*, and inſerted to the ſides of the *Corpora Cavernoſa Penis*. *I K L* The *Urethra* covered with the *Proſtatæ K L K*. *M N* The two Mucous Bags on each ſide. O The Bladder of Urine. *P* The *Muſculus Cremaſter*. *Q* The *Tunica Vaginalis* open'd. *R Vaſa Præparantia* cut from the great Trunks. *S S* The *Vas Deferens* on each ſide. *W X Y Z* The left Teſticle, as in the preceding Figure, with the oppoſite ſide here towards you. *e e* Parts of the Ureters. ** A Probe inſerted into part of the *Urethra*.

Fig. 4. The fore part of the *Penis*, as it appears when its *Corpora Cavernoſa* are fill'd with Mercury and dry'd; figur'd as big as the Life. *A B* Its forked Glans. *C C*.... The two diſtinct Apertures that appear in this Diſtention or Erection of its *Corpora Cavernoſa*. *D*... The middle part of the Orifice of the *Urethra*, which is occluded on the Intumeſcence or Erection of the *Penis*. *E* .... The two Veins of the Glans, which are compreſt by the two Sphincter Muſcles of the Male and Female in Coition. *F* The Bulbs of one of the Cavernous Bodies of the *Penis* diſtended. *G* One of the Bulbs of the Cavernous Body of the *Urethra* alſo diſtended. Theſe *Bulbi* were open'd on the other ſide ♆ to fill the Cavernous Bodies with Quick ſilver, but are all expreſt as they ought to appear on both ſides in the following Figure. *H* The *Urethra*. *I* The Muſcles dryed, expreſt Fig. 2. and 3. *F F f f G*. *K k* The Veins tyed up to keep in the Mercury, as they paſs the Muſcles of the *Bulbi*.

Fig. 5. The back part of the *Penis* expreſt in the preceding Figure. *A B* Its forked Glans. *E E* Parts of the Veins ariſing from the Glans. *F F* The Bulbs of the Cavernous Bodies of the *Penis*. *G G* The two Bulbs of the Cavernous Body of the *Urethra*. *H* The *Urethra*. *K K k k* The Veins tyed up, as they paſs out of the *Bulbi* to keep in the Mercury.

Diſſection of an Hare, by Mr. John Ray. *n*.307.*p*.2302.

V. We obſerv'd the *Inteſtinum rectum* of a great Length, having large *Pilulæ* of Dung *ſecundum intervalla*, I call here the Gut (ſo far as it had no *Cellulæ*) *rectum*, though indeed it had but one or two Convolations.

The *Inteſtinum cæcum* was of a vaſt Bigneſs and Length, in Bigneſs it far exceeded the Colon, and was full of Excrement. Juſt at the Entrance into it out of the *Ileum* was another Appendix of a Globular Figure ; the *Tunicæ* of it more fleſhy, and fuller of Veins and Arteries than the adjoyning *Cæcum* ; there was alſo a little round Hole in it. The *Cæcum* towards the farther end of it was ſmall, round, fleſhy, full of Veſſels, and colour'd like the *Jejunum* in a Man, the inner *Tunica* granulated for more than 4 Inches in Length.

The Spleen was ſmall and long, thicker at one end, it had no *Veſicula fellea* that I could find. [*In another we found the* Veſicula ſellea *manifeſtly*.] The Kidneys large, and the Left ſituate higher than the Right. The *Glandulæ Renales* receiv'd not their Veſſels from the Emulgents, but from great Veins on each ſide going to the Loins.

The Stomach was full of Graſs, as I conjectur'd, which ſmelt like the Wax of an Honey-Comb, when the Honey is newly drain'd from it.

It was a Female, and had long *Cornua Uteri*, but did not *geſtare*, when we cut it up.

It ſeemed to have ſuch a Cavity under the Tail, above the *foramen ani*, as I have obſerved in a Badger.

I believe now that the Matter contained in the Stomach was Fir chewed ſmall, the which the Smell argued.

Diſſection of a Mountain Hen by the ſame. ib. *p* 2303.

VI. In Gallina montana obſervavi appendices duas prælongas, dimidium ulnæ exceſſiſſe credo : Ad principium ſuum ubi a recto oriuntur, poſt 3 aut 4 uncias reflectuntur ſeu convolvuntur, at in prima hac convolutione nulla intus excrementa continent ; tum ſurſum juxta inteſtinum utrinque aſcendunt, & ſunt ampliſſimæ atque excrementis plenæ : Ad ingreſſum ſuum ubi inteſtino recto cohærent, habent velut annularem Muſculum ſeu Sphincterem.

Hepar ſatis grande, in duos præcipuè lobos diviſum. Veſiculam felleam nullam inveni, verum poros biliarios duos magnos, diverſis oſculis non procul tamen diſſitis, ſeſe in inteſtinum duodenum aperientes.

Lien exiguus triangularis. Ventriculus mediocris, muſculoſus, cujus interior tunica in duritiem fere corneam concreverat aliqua ſui parte : Cor ampliſſimum.

In ventriculo & ingluvie ſummitates & germina Abietis frondium, quæ apertæ reſinaceum & non ingratum expirabant odorem, materiæ in Leporino ventriculo contentæ ſimillimum.

A Puppy in the Womb, that receiv'd no Nouriſhment by the Mouth. by Mr. Brady, *n.*304. *p.*2176.

VII. The Puppy was whelp'd *November* 1704. had no Appearance of a Mouth at all, liv'd ſome time after it was parted from its Dam; pulling the Skin off its Head, which had not the leaſt paſſage through it : The Head was one ſolid Bone, without Sutures, ſomewhat round, as a Man's Skull, with a little prominence in the fore-part, reſembling the *Os Naſi* of a Man, but without any Paſſage : It had no Place for Eyes, nor *Meatus* for Ears, only the outward Reſemblance of one on each ſide, unpenetrated and plac'd lower than naturally :

rally: No Jaw-bone, nor Conveyance to the top of the *Larynx* and *Pharynx*, but thence downward natural.

A monſtrous Calf. by Dr. Adams. *n.* 311. *p.* 2414.

VIII. The Dam of a monſtrous Calf was all that a poor Man had, who finding his Cow unable to caſt her Young, employ'd his Neighbour to aſſiſt her; this Man not thinking of any ſuch Rarity, us'd ſuch Violence upon the Monſter, that he disfigur'd the Head in pulling it from the Cow; notwithſtanding it liv'd three Hours, and in all probability had lived till this time, if the Aſſiſtant had made uſe of the beſt Method in that caſe; then it dy'd, and being rip'd up was found, to the beſt of my Information, to be in all reſpects like any other of the ſame kind, excepting the Wings, which to me ſeem to be Bags formed out of the Membranes, torn and diſtended from the adjacent Parts, and by freſh ſupplies from the circulating Fluids were inlarg'd to a conſiderable Bigneſs.

The Bones of a Fœtus *in the* Uterus *of a Cow. by* Mr. Sherman. *n.* 323. *p.* 450.

IX. The Cow was very unthrifty, for which they gave her Cow Phyſick and ſuch Drinks as they thought proper for her; notwithſtanding which ſhe grew worſe, and continued a great while in a lean, pining, waſting Condition, and was reduc'd to ſo weak a State, that they believ'd ſhe would die; when on a ſudden, ſhe began to eat her Meat, and thriv'd ſo faſt, that in ſix or eight Months ſhe was ſo fat as to be ſold to the Butcher, who when he kill'd her, found Bones in her *Uterus* perfectly dry, there being no manner of Moiſture in the Bag, as the Butcher call'd it, in which they were contain'd. The ſame Digeſtive Humour which diſſolv'd the Skin, and Muſcular parts of the Calf, might, (I preſume) reaſonably enough be ſuppos'd to diſſolve the Cartilages, (and for ought I know) even Part of the Bones of a *Fœtus*.

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A full Week before the Cow was killed (upon apprehending ſhe had a Dropſy) the Butcher cut a Hole in her Belly, a little above the

Udder, and thruſt in his Hand; but finding nothing extraordinary, ſowed up the Hole, and the Cow eat her Hay, and was as well as before. After we had cut the Skin of the Head (for there was no *Cranium*) that was expanded over the fore part of the Cavity containing the Brains, I was ſurpriz'd to find, that there was very little Brains in it; I am ſure not ſo much as in a Rabbit: The whole Cavity is not big enough to hold an ordinary Walnut.

A Contagious Diſtemper among the Black Cattle in Italy, *by Dr.* Ramazzini. *n.* 338. *p.* 46.

XI. In 1711. A dreadful Contagion ſeiz'd the Black Cattle, which could not be ſtopt by Human Means. That it was in the Cow-kind is evident from the Coldneſs, Rigor and Standing up of the Hair at firſt, which was ſoon ſucceeded by a violent, ſharp, Burning, with a quick Pulſe. That this Fever was malignant, mortal and peſtilential, the concomitant Symptoms ſhew'd; ſuch as great Uneaſineſs with Difficulty of Breathing, great Pantings with a ſort of ſnorting, and at the beginning a kind of *Stupor* and Drowzineſs, a continual Flux of a ſtrong ſmelling Matter from the Noſe and Mouth, a very fœtid Dung, ſometimes with Blood, all Rumination ceaſing, Puſtules breaking out over the whole Body on the 5th or 6th day, like the Small-Pox; they all generally dy'd about the 5th or 7th Day, very few of them eſcaping.

The Author deduces this Diſtemper from a contagious Original. He tells us, it is certain, that out of a great Drove, ſuch as the Merchants bring yearly into *Italy* out of *Dalmatia* and the neighbouring Countries, one Beaſt happen'd to ſtraggle from the reſt, and be left behind; which a Cowherd finding, brought to a Farm belonging to the Illuſtrious and Reverend Count *Borromeo*, Canon of *Padua*: This Beaſt infected all the Cows and Oxen of the Place where he was taken in, with the ſame Diſtemper he labour'd under; the Beaſt itſelf dying in a few Days, as did all the reſt, except one only, who had a Rowel put into his Neck.

'Tis no ſtrange thing therefore, if from the *Effluvia*, like an Atmoſphere, proceeding from the ſick Cattle, from thoſe dead, and from the Cowhouſes and Paſtures where they were fed, and by that means infected, and chiefly from the Cloaths of the Cowherds themſelves, this Infection falling upon a proper Subject ſhould diffuſe itſelf ſo largely. When therefore this ſubtile venemous Exhalation happens to meet with any of the Cow-kind, joyning itſelf with the ſerous Juices and Animal Spirits, whilſt it is carry'd all over the Body, it diſorders the natural conſiſtence of the Blood, and corrupts the Ferments of the *Viſcera*; whence it naturally follows, that the natural Functions of the *Viſcera* are vitiated, and the requiſite Secretions ſtop'd. For

Dr. *Ramazzini* not only ſuppoſes, but aſſerts, that this Poiſon is of that kind, which rather fixes and coagulates, than diſſolves the Blood: For beſides the forementioned Symptoms accompanying the Diſeaſe, the Eye it ſelf is a Witneſs; ſince the dead Carcaſes being opened while they are yet hot, little or no Blood nevertheleſs runs out; thoſe Animals having naturally a thick Blood, eſpecially when the Fever has continued ſo many Days. Whether therefore this Plague came firſt from the foreign Beaſt, or any other way, it is the ſame thing, when at laſt it fell upon ſome Animal in which there was the morbid Seminary or Ground prepared for it.

In the dead Bodies of all the Cattle it was particularly obſerved, that in the *Omaſus*, or Paunch, there was found a hard compact Body, firmly adhering to the Coats of the Ventricle, of a large Bulk, and an intolerable Smell: In other Parts, as in the Brain, Lungs, *&c.* were ſeveral *Hydatides*, and large Bladders fill'd only with Wind, which being open'd gave a deadly Stink; there were alſo Ulcers at the Root of the Tongue, and Bladders fill'd with *Serum* on the ſides of it. This hard and compact Body, like Chalk, in the *Omaſus*, the Author takes to be the firſt Product of the contagious *Miaſma*. He adds a Prognoſtick, believing that from ſo many Attempts and Experiments, and the Method obſerv'd in the Cure of this Venom, at laſt a true and Specifick Remedy will be found out to extirpate the poiſonous Malignity wholly: He alſo expects ſome Mitigation of it, from the approaching Winter and North Winds. He does not think this Contagion can affect Human Bodies, ſince other Species of ruminating Animals, ſymbolizing with the Cow-kind, are yet untouch'd by it; nor was the Infection catch'd from the Air, provided due Care was taken in burying the dead Bodies.

As for the Cure of it: For the Chirurgical Part he commends Bleeding, burning on both ſides the Neck with a broad red-hot Iron, making Holes in the Ears with a round Iron, and putting the Root Hellebore in the Hole, a Rowel or Seton under the Chin in the Dewlaps; he alſo orders the Tongue and Palate to be often waſh'd and rub'd with Vinegar and Salt. As for the *Pharmaceutical* Part; he recommends *Alexipharmicks*, and ſpecifick Cordials; and from the *Vegetable Kingdom*, 3 Ounces of *Jeſuits Bark*, infus'd in 10 or 12 Pints of Cordial Water or ſmall Wine, to be given in four or five Doſes; which is to be done in the beginning of the Fever when the Beaſt begins to be ſick. From the Animal, two Drams of *Sperma Cæti* diſſolv'd in warm Wine. From the Mineral, *Antimonium Diaphoreticum*. Againſt Worms breeding, an Infuſion of Quickſilver, or *Petroleum* and Milk is to be given. And laſtly, as to the Food, Drinks made with Barly or Wheat Flower or Bread like a *Ptiſane*, freſh ſweet Hay made in *May* and macerated in fair Water. In the mean time the Cattle muſt be kept in a warm Place, and cloath'd, to keep them as much as poſſible from the cold Air, daily making Fumigations in the Cowhouſes with *Juniper Berries*, *Galbanum*, and the like. As to Prevention, he enjoyns Care in cleaning the Stalls, and ſcraping the Cruſt off from the Walls; Care alſo is to be taken of their Food, that it be good, the Hay and

Straw not ſpoil'd by Rain in the making, and judges their Food ought to be but ſparing; Friction, rubbing, and currying, not only with the Hand, but with a Currycomb and Bruſh; with Setons under their Chin, made with a hot Iron run through the Part, and kept open with a Rope put through it.

A Medicine for a mortal Diſtemper amongſt Cows: from Holland. *ib. p.* 50.

XII. *Recipe Veronicæ, Pulmonariæ, Hyſſopi, Scordii, ana M.* iv. *Rad. Ariſtolochiæ rotundæ, Gentianæ, Angelicæ, Petaſitidis, Tormentillæ, Carlinæ, ana unc.* 12. *Bac. Lauri & Juniperi, ana unc.* 12. *Miſc. fiat Pulvis.*

Bleed the Cow, and give her every Morning for 3 or 4 Mornings an Ounce of this Powder with a Horn in warm Ale.

If the Cow's Illneſs continues, after the Omiſſion of 2 or 3 Days, repeat the Medicine for 3 or 4 Days again.

Of the Diſtemper amongſt the Cows near London. *by* T. Bates, *Eſq; n.* 358. *p.* 872.

XIII. About the middle of *July*, 1714. the Diſtemper appear'd at *Iſlington*, and thereupon the Lords Juſtices were pleaſed to command, that I ſhould examin into the Truth of the Report of its being contagious; and order'd the Lord *Harcourt*, then Lord Chancellor, to grant ſuch Authority as would be proper to make ſuch Diſcovery. Accordingly, Mr. *Milner*, Mr. *Offley*, Mr. *Richardſon*, and Mr. *Ward*, four Juſtices of the Peace for *Middleſex*, were appointed to make the neceſſary Examinations.

Purſuant to thoſe Orders, we went to *Iſlington*, where Mr. *Ratcliffe* had loſt 120 out of 200; Mr. *Rufford* 62 out of 72; Mr. *Pullin* 38 out of 87. They were very unwilling to own it, becauſe ſo ſoon as it ſhould be known, no Body would buy their Milk: but Mr. *Ratcliffe*, a Man of good Judgment in Cattle, after much Perſuaſion, gave us the following Account, *viz.* that they firſt refuſed their Food: the next Day had Huskiſh Coughs, and voided Excrements like Clay; their Heads ſwelled, and ſometimes their Bodies. In a Day or two more there was a great Diſcharge of a mucous matter by the Noſe, and their Breaths ſmelled offenſively. Laſtly, a ſevere Purging (ſometimes bloody) which terminated in Death. That ſome died in three Days, and others in five or ſix, but the Bulls lived eight or ten. That during their whole Illneſs, they refuſed all manner of Food, and were very hot.

We then adviſed with ſeveral of the Cow-leeches or Doctors, who all agreed, that it was a Murrain, or rather a Plague; and that the Methods they had try'd for a Cure, had proved unſucceſsful. This Diſeaſe was ſo ſurprizing, that ſome of thoſe Men who uſed to look after them, were afraid to go near them. We then ordered ſome of the ſick Cows to be houſed, and ſeveral ſorts of Cattle to be kept with them, to ſee whether the Contagion would affect any other Species. Afterwards I drew up and gave the following Propoſals to their Excellencies.

I. That all ſuch Cows as are now in the poſſeſſion of Mr. *Ratcliff*, *Rufford*, and *Pullin*, be bought, kill'd, and burnt: or, at leaſt, that the ſick be burnt; and the well kept and ſecured on the Grounds where they now are, that ſuch of them as ſicken or die of this Diſtemper may be burnt.

II. That the Houſes in which thoſe ſick Cows have ſtood be waſhed very clean, and then ſmoaked by the burning of Pitch, Tarr, and Wormwood, and be kept three Months at leaſt before any other Cows are put therein.

III. That the Fields where theſe ſick Cows have grazed, be kept two Months before any other Cows are ſuffered to ſtand or graze thereon.

IV. That the Perſons looking after ſuch as are ill, ſhould have no Communication with thoſe that are well.

V. That the ſame Methods be obſerved if any other of the Cow-keepers ſhould get this Diſtemper among them: and that they be all ſummoned and told, that as ſoon as they perceive any of the Cows to refuſe any of their Meat, or have any other Symptoms of this Diſtemper, that they immediately ſeparate them from the others, and give notice to ſuch Perſons as your Excellencies ſhall appoint, that they may be burnt; and the Places where they have ſtood or grazed to be ordered as before.

VI. That the Cow-keepers be required to divide their Cows into ſmall Parcels, not more than ten or twelve in a Field together; and that they be allowed ſuch Satisfaction for complying with theſe Propoſals, as your Excellencies ſhall think fit; all which is moſt humbly ſubmitted, *&c.*

The Gentlemen then by Command from the Lords Juſtices, ſummon'd all the Cow keepers in the Country, and acquainted them with the abovenamed Propoſals to moſt of which they readily complyed, as being viſibly their Intereſt; and offered them Forty Shillings for every Cow which they burnt, that had not been ſick above twenty four Hours; but for ſuch as had been longer ill, or were dead, they would allow them only the value of their Skins and Horns.

Some of the Cow-keepers appeared not content with this Regulation, and believing that the Diſeaſe would become general, deſign'd to have ſold their Cows at ſome diſtant Market; which the Gentlemen having notice of, appointed ſeveral Butchers to watch near their Grounds, and count their Numbers every Morning, with Orders to follow ſuch as they ſent to any Market to prevent their being ſold, by telling the People what they were. Another great Obſtacle at the firſt was the Cow-keepers not owning the Diſeaſe, till they had loſt ſeveral of their Cows; for ſo ſoon as it was known that any Man had but one ſick, none would buy his Milk; and to thoſe who kept many Cows, that Loſs was conſiderable, Nor was there ever wanting one or other who gave them hopes of a Cure.

To obviate theſe Difficulties, the Gentlemen encouraged them to hope for a Brief; but aſſured them that ſuch only as complyed with theſe Directions, ſhould have any Benefit by it. Accordingly, they ordered a daily Account to be taken of the Conduct of each Cow-keeper, and allowed or diſallowed their pretenſions to this Brief, as well as to the Forty Shillings *per* Cow, as they complyed or diſregarded theſe Directions. This had pretty good Effect.

I had Orders from the beginning to aſſiſt theſe Gentlemen with my Advice, which I did at moſt of their meetings; as alſo to make a ſtricter Enquiry into the Diſeaſe by Diſſections, *&c.* Accordingly I diſcourſed the Cow-leeches about the Cuſtoms and Diſeaſes that Cows were ſubject to, and conſulted ſuch Books as treated of them; but concerning this Diſeaſe, I could gain but ſmall Aſſiſtance from either. I then made Diſſections of ſixteen Cows, in different degrees of Infection; and found the Putrefaction of their *Viſcera* to encreaſe, in proportion to the time of their Illneſs.

The firſt five that I opened, had herded with thoſe that were ill, and the Symptoms of this Diſtemper were juſt become viſible; in theſe, the Gall-bladders were larger than uſual, and filled with Bile of a natural Taſte and Smell, but of a greener Colour. Their *Pancreas*'s were ſhrivelled, ſome of the Glands obſtructed and tumified. Many of the Glands in their *Meſenterys* were twice or thrice their natural bigneſs. Their Lungs were a little inflamed, and their Fleſh felt hot. All other Parts of their *Viſcera* appeared as in a healthful State. The next ſix that I opened, had been ill about two Days; in them the Livers were blacker than uſual and in two of them, there were ſeveral Cyſts filled with a Petrified Subſtance like Chalk, about the bigneſs of a Pea. Their Gall-bladders were twice their uſual bigneſs, and filled with Bile of a natural Taſte and Smell, but of a greener Colour than the firſt. Their *Pancreas*'s were ſhrivelled, ſome of their Glands very large and hard, and of a blackiſh Colour. The Glands in their *Meſenterys* were many of them five times their natural bigneſs, and of a blackiſh Colour. Their Lungs were inflamed, with ſeveral ſmall Cyſts forming. Their Inteſtines were full of red and black Spots. Their Fleſh was very hot, tho' not altered in Colour. The five laſt that I opened, were very near dying; in them I found the Liver to be blackiſh, much ſhrivelled and contracted, and in 3 of them, there were ſeveral Cyſts as big as Nuts or Nutmegs, filled with a petrified Subſtance like Chalk. Their Gall-bladders were about three times their uſual bigneſs, and filled with a Bile of a natural Taſte and Smell, but of a deep green Colour. Their *Pancreas*'s were ſhrivelled and contracted, many of their Glands very large and hard, and of a black Colour. The Glands in their *Meſenterys* were many of them diſtended to eight or ten times their Natural bigneſs, were very black, and in the *Pelvis* of moſt of thoſe Glands in two Cows, there was a yellow Petrefaction, of the conſiſtence of a ſandy Stone. Their Inteſtines were the

Colour of a Snake, their inner Coat excoriated by Purging. Their Lungs were much inflamed, with ſeveral Cyſts, containing a yellow purulent matter, many of them as big as a Nutmeg. Their Fleſh was extream hot, though very little altered in Colour.

The following Caſes being very extraordinary, I could not omit the mention of them, *viz.* In one of them the Bile was petrified in its Veſſels, and reſembled a Tree of Coral, but of a dark yellow Colour, and of a brittle Subſtance. In another there were ſeveral Inflammations on the Liver, ſome as large as half a Crown, cracked round the Edges, and appeared ſeparating from the ſound Part, like a Peſtilential Carbuncle. In a third, the Liquor contained in the *Pericardium* (for Lubricating the Heart in its Motion) appeared like the Subſidings of *Aqua Calcis*; and had excoriated, and given as yellow a Colour to the whole Surface of the Heart and *Pericardium*, as *Aqua Calcis* could poſſibly have done.

In giving my Opinion of this Diſtemper, I muſt beg leave to premiſe, that all Cows have naturally a Purgation by the *Anus* for 5 or 6 Weeks in the Spring, from (as the Cow-keepers term it) the Frimneſs of the Graſs; during which time they are brisk and lively, their Milk becomes thinner, and of a blewiſh Colour, ſweeter to the Taſte; and in greater Plenty: but the Spring preceding this Diſtemper, was all over *Europe* ſo dry, that the like has not been known in the Memory of any one living; the Conſequence of which was little Graſs, and that ſo dry and void of that Frimneſs which it has in other Years, that I could not hear of one Cow-keeper, who had obſerved his Cows to have that Purgation in the ſame degree as uſual; and very few who had obſerved any at all. They all agreed that their Cows had not given above half ſo much Milk that Summer as they did in others; that ſome of them were almoſt dry; that the Milk they did give was much thicker, and yellower than in other Years. It was obſerved by the whole Town, that very little of the Milk then ſold would boyl without turning; and 'tis a known Truth, that the weakeſt of the common Purges you can give a Cow entirely takes away her Milk; from all which Circumſtances I think it evident, that the want of that natural Purgation was the ſole Cauſe of this Diſeaſe; by producing thoſe Obſtructions, which terminated in a Putrifaction and made this Diſtemper contagious. Cows are likewiſe ſubject to a Purgation (though in a leſs degree) from the ſame Quality in the Graſs, about the latter end of *September*; which is called the latter Spring; and which I believe contributed not a little to the preventing the encreaſe of this Diſtemper; for this Purgation coming ſo ſoon after the Diſeaſe appeared, it is not unreaſonable to ſuppoſe, that it freed ſuch Cows as were not much injured, from the ill Effects of thoſe Obſtructions; occaſioned by the want of their Vernal Evacuations.

Several Phyſicians attempted the Cure, and made many Eſſays for that purpoſe; but the Diſſections convinced me of the Improbability of their ſucceeding, with which I acquainted their Excellencies. However they having received a *Recipe* * and Directions from ſome in *Holland*, ſaid to have been uſed there with good Succeſs, gave me Orders to make Tryal of it: But in very many Inſtances, I was not ſenſible of the leaſt Benefit. I think there is no one Method in Practice, but what was tryed on this occaſion, though I cannot ſay that any of them was attended with appearance of Succeſs; except that of Bleeding plentifully, and giving great Quantities of Cooling and Diluting Liquids. But by this Method, the Inſtances of Succeſs were ſo few, that they do not deſerve any further mention.

* *vid. ſupra, p.* 342.

Their Excellencies being informed that the feeding the Cows with Diſtillers Grains was a new Cuſtom, and was the Cauſe of this Diſeaſe, gave me Orders to examine into the Truth of it; but upon enquiry, I found it to have been the Practice of ſeveral of the Cow-keepers above twenty Years, without the leaſt appearance of any Inconvenience; and that ſome of thoſe Perſons who had ſuffered moſt, had never any. Nor is there any Difference between thoſe of Brewers and Diſtillers, only that the latter are the dryer. It was likewiſe ſaid, that the want of Water was the Cauſe of this Diſeaſe, for that the Springs and Places where People uſed to water their Cows, were almoſt every where dry; and that many were obliged to ſend them ſeveral Miles for Water. This might produce ſome Diſeaſes, but ſuch only as they got by the Fatigue of being driven ſo far; for Mr. *Ratcliff* Mr. *Rufford* and Mr. *Pullen*, the three Perſons where this Diſeaſe firſt appeared, had the New River Water running through the very Grounds where their Cows conſtantly grazed, and could drink at their Pleaſure, and ſo had moſt of the Cow-keepers at *Iſlington*.

About the latter end of *September*, the Diſeaſe increaſed, and the Numbers brought to be burnt were ſo great, that it could not be well executed; therefore it was judged proper only to bury them fifteen or twenty Foot deep; but firſt to make large Inciſions in their moſt Fleſhy Parts, and to cover them with Quicklime. In the beginning of *October*, being informed that ſome of the Cows in *Norfolk, Suffolk*, and *Hertfordſhire*, had got this Diſeaſe, and apprehending that it would become general; I gave in the following Report to a Committee of Council.

The Diſtemper among the Cattle encreaſing, and beginning to appear in ſeveral Counties, I thought it my Duty to acquaint your Lordſhips, with the hazard that may attend their not being duly buried. It is the Opinion of all Authors in Phyſick that treat of contagious Diſeaſes, as well as of ſeveral of the Phyſicians in Town, that a Putrifaction of ſo many Cows as there is reaſon to fear will die of this Diſtemper, may produce ſome contagious Diſeaſe among Men;

unleſs they are buried ſo deep that the infectious *Effluvia* cannot injure the Air, which I am certain has very ſeldom been complyed with, except in the Counties of *Middleſex*, *Eſſex*, and *Surry*, the Gentlemen employed being capable of acting in thoſe Counties only. It is affirmed by ſeveral now living, that there was a Mortality among the Cattle, a little before the laſt Plague in the Year 1665, which was imputed to the want of a due care in burying them. And your Lordſhips may know of what importance it was judged by the King of *Pruſſia*, the States of *Holland*, and ſeveral other Princes and States, by the care they took to publiſh Decrees and Placarts, commanding them to be buried upon pain of Death, or other ſevere Penalties; and I humbly conceive it would be neceſſary, not only to bury thoſe which ſhall die, but that all ſuch as are already dead may have the ſame care; as alſo that they be buried nine or ten Foot deep at leaſt. All which is moſt humbly ſubmitted, *&c.*

Their Lordſhips thought fit to defer all proceeding upon this Report, till the Diſtemper becoming more general ſhould make it neceſſary; but I thank God that Neceſſity never happened, for within 3 Weeks or a Month after the giving in of that Report, the following Particulars concurred to put an end to the Diſeaſe.

The Cows began their latter Purging, which contributed much to prevent the Diſeaſe from appearing in freſh Places; and the Cowkeepers were convinced that the Diſeaſe was incurable. The Knowledge of the Diſeaſe was ſpread all over *England*, ſo that none would buy a Cow in the Country; and the Gentlemen prevented their being kill'd in Town, by having the Markets examined daily; and ſuch Meat condemned as appeared ſuſpicious. They now divided their Cows into ſmall Parcels, by which they loſt only that in which the Diſeaſe happened; whereas before that Method, when one Cow got this Diſeaſe, if ſhe had herded with one, two, or three hundred (the Contagion was ſuch) ſcarce one eſcaped. Thoſe who had no ſick Cows avoided all Communication with ſuch as had. They likewiſe found that the keeping their Cows ſo long when ill, had been the chief Cauſe of their Loſs; they therefore now brought them to be buried on the firſt Appearance of the Diſeaſe, before the Contagion could poſſibly have got to any great Height.

The Severity of this Diſeaſe in *England* did not laſt above three Months; though it was not entirely ſuppreſſed till about *Chriſtmas*: But in ſeveral other Countries it continued two or three Years; and I am credibly aſſured, that in *Holland* it now rages with as much Violence as ever; and that they have loſt in Cows, Oxen and Bulls above three hundred thouſand.

The Providence of God has ſo diſpoſed the Matter of Animal Bodies, as to render contagious Diſeaſes very ſeldom infectious to different Species; but Experience demonſtrates that Contagions may be communicated to the ſame Species, by touching the Woollen, Linnen, *&c.* to which the infectious *Effluvia* of the Diſeaſed had adhered, tho' the two Bodies ſhould be at a very great diſtance; and I verily believe that more Hundreds died from the Infection, which was carried by the Intercourſe that the Cow-keepers had with each other, than ſingle ones by the original Putrifaction.

The number of Bulls and Cows loſt by this Diſeaſe, in the Counties of *Middleſex*, *Eſſex* or *Surry*, were Five Thouſand Four Hundred and Eighteen; and of Calves, Four Hundred and Thirty Nine; and the Money iſſued for them, at Forty or Ten Shillings *per* Cow, *&c.* was the Royal Bounty of His Majeſty, from his own Civil Liſt: and tho' neither the four Gentlemen, nor I, made any demand for a Reward, or for Expences, yet it amounted to 6774 *l.* 1 *s.* 1 *d.* But the entire loſs to the Cow-keepers, as delivered in upon Oath, was 24500 *l.* (excluſive of the 6774 *l.* 1 *s.* 1 *d.*) tho' computed but at Six Pounds *per* Cow; which at a Medium was not more than their prime Coſt; the dearneſs of keeping them near *London* neceſſitating the Cow-keepers to buy the very beſt.

A Worm in the Head of Sheep by Dr. Thorpe. *n.* 295. *p.* 1800.

Plate 12.

XIV. I ſend you a Delineation of a Worm found in diſſecting the Head of a Sheep, in the Cells form'd between the Laminæ of the *Os frontis.* It is an *Apode*, and ſeems to be a Species of the *Eulæ*, tho much different from the common ſort breeding in putrid Fleſh. 'Tis every where of a fair pale colour, excepting its Tail, which ends a little obliquely in a Plane; on which are impreſs'd 2 remarkable black Spots (as in *Fig.* 12.) Beſides two ſmall white *Corniculæ*; its Head is arm'd with a pair of black ſharp and crooked Forcipes, which in contracting and extending its body, it draws in and puts out at pleaſure: with theſe in creeping it takes hold on the Surface of the Body, on which it moves, and draws itſelf forward, on pretty large protuberant, and ſomewhat flattiſh *toruli*, fewer in Number than thoſe on its back (*v. Fig.* 13.) which alternately ſwell'd and relax'd, ſeem inſtrumental to its motion, and ſupply the place of Feet. It looks of a clear, Chryſtalline ſubſtance, and almoſt tranſparent.

The Membrane, that inveſted the Cavity of the Cells containing it, was very fat, and in moſt places ſeparated from the Bone; the Blood-Veſſels appear'd turgid, and inflam'd: Whereas the Membrane of the oppoſite Cells, which have no Communication with theſe, was thin, pellucid, adherent, and no ways preternaturally affected.

I have given the more particular deſcription of this Worm, and the Cells it was found in, it not being deſcrib'd by any Author I have yet conſulted. Mr *Bobart* informs me, ‘ That ſome curious Gentlemen of the Univerſity lately obſerv'd three Worms lodg'd in the ſame parts of the Head of a Sheep, but in two diſtinct Cells: The largeſt apart by its ſelf, the other two in the Cell adjoyning; one of which was conſiderably leſs than the other, agreeing in form with the forementioned, of a whitiſh colour in general, with the two

notable Spots on the flat of the poſterior part, but a ſhadow of brownneſs from the back down the ſides, (eſpecially of the riper one;)
‘ roundly turgid on the back, and flat underneath; divided with ſeve-
‘ ral *annuli*, as theſe Creatures generally are; at the extremity of
‘ which Protuberances, ſerving inſtead of Feet, there appears a little
‘ darkiſh brown ſpot on each ſide or edge: as they faded and wither'd
‘ they chang'd to a light red or phœnicious colour, and afterwards
‘ brown.

Of Hydatides *incloſ'd in a Sheep's Kidney. by Mr.* Cowper. *n.* 307. *p.* 2304.

XV. In a Sheep's Kidney I found a large whitiſh Body inclining to yellow, and ting'd with Red, as it lay under the Membrane of the Kidney, *v. Fig.* 14 *A.* This was very hard, as is uſual in Animal Petrifactions; 2 thirds of it lay hid within the Subſtance of the Kidney. It was incloſed with a thick Membrane, which could not eaſily be ſeparated from it, even with a Needle flat in the end of a Stick. The Branches of the emulgent Veins and Arteries lay between it, and the *Pelvis* of the Kidney; all which Veſſels were ſomewhat preſt by this petrified Body. As I was picking off its thick ſtrong Membranous Incloſures, I found the Needle ſlip into a Cavity at an Aperture *Fig.* 4. By this I was inform'd (of what I confeſs I had no Suſpicion) that this hard and heavy petrifi'd Body was hollow, whereupon I thought of dividing it with a Saw, but finding a Membranous Interſtice in it, *Fig.* 15. *B.* I pulled it aſunder as expreſt *Fig.* 16. and found its inſide divided by many petrified Shells C. of irregular Figures, and fill'd with *Hydatides*, ſome of which are repreſented at *D.*

Plate 12.

Fig. 14. The external Surface of a Sheep's Kidney. *A* the petrified Body as it appeared in it before Diſſection.

Plate 12.

Fig. 15. The interior Surface of the ſame petrified Body, after the Membrane that incloſed it was taken off. *a* The Hole by which 'twas diſcover'd to be hollow. *B* The Fiſſure by which 'twas divided to ſhew its Inſide expreſt

Fig. 16. C. Its petrified Shells that contained the *Hydatides* of various Sizes and Figures, expreſt at *D* when taken out.

The Heart of an American *Land Tortoiſe anatomically deſcrib'd by Mr* Buſſiere. *n.* 328. *p.* 170.

XVI. The Heart in this Animal is ſituated in the *anterior* part of the capacity that maketh the *Abdomen*, ſeparated from all the other *Viſcera* by a large *Pericardium*, which encloſeth it. This *Pericardium* is faſtned by its *ſuperior* part to the Spine of the Back, by the *anterior* to the Muſcles of the Neck; which is the cauſe that the Heart moveth forward when the Animal putteth forth his Head out of the Shell, and backward when he draws it in: By the *Inferior* part it adheres to the *Peritoneum*, which is faſtned to the lower Shell; ſo that by all theſe Ligaments the *Pericardium* is kept diſtended ſufficiently, that the Heart hath an entire liberty in it. In this *Pericardium* there is found a good quantity of a very clear and tranſparent Water, which hath the ſame uſe there, as that which is found in the *Pericardium* of other Animals.

'Tis in the middle of this *Pericardium* that the Heart is ſuſpended; to wit, at its *Baſis* by the Arteries, and at its inferior part by a little Tendon, or a very thin Ligament, which from the Point or Cone of the Heart, aſcended to inſert it ſelf to that part of the *Pericardium* which adheres to the Back. This little Ligament is very remarkable in this, that by its means the Point of the Heart is ſuſpended on the Level of its *Baſis*; without which 'tis viſible that the Point of the Heart would fall lower, and bend the Veſſel of the *Baſis*, which might have interrupted the free Circulation of the Blood, and by conſequence would have endanger'd the Life of the Animal. The *Pericardium* being opened, the Heart appeareth as if it was ſtanding by itſelf, being only fix'd to the Arteries which go out of it (ſuppoſing the Animal turned upon its Back) its Auricles being ſeparated and hid under its *Baſis* and Arteries, towards the Back of the Animal; which is very different from the Sea Tortoiſes, where the Auricles are ſituated on the Right and Left Angle of its *Baſis*, by which way they puſh the Blood into the Heart.

The Figure of the Heart of this Animal is almoſt lenticular; making nevertheleſs three obtuſe Angles, two on the *Baſis*, one to the Right, and the other to the Left; the third is at the Inferior part, where the little Tendon, which ſuſpendeth the Heart on the Level of its *Baſis*, is inſerted. If this Animal be opened alive, you have the ſatisfaction to ſee the Circulation of the Blood, by reaſon of the tranſparency of the Membranes of the Veins, and the Alternative Motions or Dilatations of the Heart and Auricles, and the Arteries and Veins, which are very ſlow in this Animal.

From the *Baſis* of the Heart paſs out four great Arteries, that appear diſtinctly ſeparated one from the other; whereas in that of the Sea Tortoiſe, theſe Arteries are involved, for the length of an Inch, in a *capſula* common to them all, which maketh them to appear as if they were but one Trunk. If theſe four Arteries be entirely cut, the Heart is no more ſuſpended, but by the conjunction of the two *Muſculous* Conduits of the Auricles, which pierce the Heart in its *poſterior* part, towards the middle of the Heart, on the Left ſide; by which the Blood runneth from the Auricles into the Ventricle of the Heart. Theſe Arteries being thus divided, and the Heart turned over, the Auricles appear lying tranſverſely againſt the Back, in the capacity of the *Pericardium*: They make but one continued fleſhy Body, a little extended, about two thirds inclining to the Left ſide. 'Tis in this Body that the Cavities of the Auricles are ſeparated the one from the other, by a *muſcular Septum*, ſituated Internally to that Place, which appears contracted Externally. Theſe Auricles make a *muſcular* Production about ſix Lines long, which uniteth them to the Heart, towards the middle and left of its backſide. This Production is compoſed of two Conduits, ſeparated only from one another by the Extenſion of the *Septum*, which divideth the two Auricles: It is by theſe two Conduits that the Blood floweth from the Auricles into the Heart. The Body of theſe Auricles hath no adherence to the *Pericardium*, nor any ſupport but that of the Veins, which end in it; for if you divide theſe Veins, the Heart and Auricles come out of the Body; and then if you ſuſpend the Heart by the Auricles, they reſemble two Funnels joyned together, the little end of which opens into the Ventricle of the Heart, to pour the Blood into it: And 'tis in this manner we are to conceive them, in the Natural Situation of the Animal.

After having thus conſidered the External Parts of the Heart and its Auricles, we are to proceed to the Examination of the inſide of both of them. In order to that, it muſt be opened at its inferior Surface, (ſuppoſing the Animal turned upon its Back) becauſe all the Orifices of either the Arteries and Veins, and their Valves, are in the oppoſite ſide: Therefore a Probe may be introduced through one of the Arteries into the Heart, and it opened upon it; after that, you cut all this ſide round about the Inferior Circumference, from one Angle to the other, and then turn over all that part which is cut on the *Baſis* of the Heart: For then it is eaſy to remark and view all the Internal Parts of an Heart, and obſerve that there is but one ſole Ventricle, which comprehends the whole extent of the Heart, and is as uniform and plain as either of the *Ventricles* of the Human Heart, or of any other Animal whatſoever; and that is impoſſible to remark any kind of *Septum*, either Muſculous or Membranous, that might make any Diviſion or *Cellule* in this *Ventricle*: And 'tis very ſurprizing, that the Anatomiſts of the Royal Academy of *Paris* have ſhewn, the one three, and the other four *Ventricles*, in the Heart of a Land Tortoiſe of *America*.

After having conſidered the Extent of the Cavity of the Heart, there remain two things to be examined. The firſt is, that in its back part there are five Holes or Orifices, two whereof are on the left Side: Theſe are the Orifices of the two Funnels of the *Auricles*: They are covered by a large *Valve* lying flat upon them, ſupported in its middle by the Prolongation of the *Septum*, which divides the *Auricles*, in ſuch a manner, that half of it covers the Orifice of the right *Auricle*, and the other half that of the left; ſo that this *Valve* reſembles two folding Doors of a Porch, which have the ſame ſupport, and whereof one opens or ſhuts to the right, and the other to the left. It is viſible, that this *Valve* permits the Entrance of the Blood into the *Ventricle* of the Heart, but oppoſes its return into the *Auricles*; becauſe this Blood, being once in the Heart, preſſes by its own Weight upon this double *Valve*, and keeps it cloſe and flat upon theſe Orifices: Which confirms perfectly well the Office of the *Valve*, which is in the *Foramen Ovale* in the Heart of an Human *Fœtus*, the Diſpoſition being entirely the ſame. The other three Holes lying on the right Side of the *Ventricle* of the Heart, are the Orifices of the four Arteries which come out of the *Baſis*: Of theſe three Holes, that which is the moſt left is the Orifice

rifice of the Pulmonary Artery ; that which is the higheſt, is the Orifice of the *Aorta ſiniſtra deſcendens* ; and that which is moſt to the right Side, is common to the *Arteria Aorta dextra*, and to the *ſuperior Aorta*. Each of theſe Orifices is furniſhed with two Semilunary *Valves*, which permit the Blood to paſs without difficulty from the *Ventricle* of the Heart into the Arteries, but hinder its return into the Heart. 'Tis a pure Illuſion, to place theſe Holes in different *Ventricles* ; they are all in one and the ſame Cavity ; ſo that the Blood enters into this only Cavity, by the two Holes which are on the left Side, and goes out of this ſame *Ventricle*, by the three Holes which are on the right Side.

The ſecond thing remarkable in this Ventricle is the Fibres of the Heart. They are of 2 ſorts ; ſome are External, diſpoſed under the common Membrane in ſeveral Plans, very ſmall, but obliquely circular, extending from the *Baſis*, but particularly about the Arteries, which ſerve them inſtead of Tendons or Points of Support, towards the inferior Circumference of the Heart : The other Muſculous Fibres which compoſe the Heart, are in the manner of ſeveral Columns, as thoſe of the Human Heart ; they are ſituated internally in both ſides, lying obliquely from the Right, where their Tendons are about the Arteries, to the left ; which demonſtrates that their Action is from the left to the right Side, where the Orifices of the Arteries lie open, to let the Blood paſs out.

It has been ſaid before, that the two *Auricles* of the Heart of the Land Tortoiſe of *America*, make externally but one continued Body ; but that it has internally two Cavities, ſeparated from one another by a Muſculous *Septum*. This *Septum* ſeparates them ſo exactly, that there is not the leaſt Communication of the one with the other ; ſo that the Blood of either *Auricle* does not mix with that of the other, but in the Ventricle of the Heart. The Right Auricle is as big again as the Left ; all the Blood of the Animal (that of the Lungs excepted) paſſing through it to go into the Heart ; the left Auricle receiving only the Blood which cometh from the Lungs, the Pulmonary Veins being very ſmall. The internal Part of the *Auricles* are furniſhed with little Muſculous Columns, but particularly at their Extremities, ſituated in ſuch a manner, that it is viſible their Action tends to puſh the Blood againſt the *Septum*, where the Conduits, which convey it into the Heart, are ſituated.

There is in the bottom of the right Auricle an oblong Orifice, by which the Blood cometh into its Cavity from the great Reſervoir of the Veins, ſituated on the back part of the Heart. This Orifice is furniſhed with two Semilunar oblong *Valves*, diſpoſed in ſuch manner, that when the Auricle is relaxed, the Blood enters its Cavity, but when contracted, they ſhut cloſe to hinder the Blood from returning into the Veins : The Orifice of the Funnel, or the Conduit into the Heart, is to be ſeen againſt the *Septum*. The left Auricle hath exactly the ſame Structure as the right: 'Tis in the bottom of this Auricle, that the Oriſice, common to the two Pulmonary Veins, is to be obſerved furniſhed with two Semilunar *Valves*; and againſt the *Septum* to the Right, that the Funnel or Conduit into the Heart is ſituated, joining with the Funnel of the right Auricle. Theſe two Conduits are ſeparated from one another by the continuation of the *Septum*, which divides the Auricles to the very *Ventricle* of the Heart, and is as a ſupport to the double *Valve* which covers their Orifices in the Heart.

Of the Veſſels of the Heart.

It has been ſaid before, that from the Baſis of the Heart of the Land Tortoiſe of *America* there goes out four great Arteries. Of theſe, the firſt which preſents itſelf, (the Tortoiſe being turn'd upon his Back) is the Pulmonary Artery: It is more on the Left Side than the others, and is much bigger for the ſpace of an Inch; then it divides it ſelf into two Branches, the moſt apparent whereof cometh from the right Side of its Trunk, and turns itſelf over towards the Left Side, accompanying the *Aorta inferior ſiniſtra,* till it hath pierced the *Pericardium*; after that it unites with the left Branch of the *Trachea Arteria,* which it accompanies through all the Extent of the left Lobe of the Lungs. The other Pulmonary Branch, going out of the left Side of its Trunk, turns itſelf over immediately croſs upon the other Arteries, from the Right to the Left, to joyn the *Aorta inferior dextra,* till it has pierced the *Pericardium,* where it joyns to the right Branch of the *Trachea Arteria,* which it accompanies through the whole Extent of the right Lobe of the Lungs.

One thing ſeems to me very remarkable in this Pulmonary Artery; it is this, that though its Trunk, in going out of the Heart, hath more than twice the Diameter of the *Arteria Aorta ſiniſtra,* yet the two Branches which it ſends to the Lungs, have not either of them one third of the Diameter of the *Aorta ſiniſtra.* In the Arteries, which I have fill'd with Wax, the Trunk of the Pulmonary Artery hath between ſeven and eight Lines Diameter; the *Aorta ſiniſtra* four and a half; and the Pulmonary Branches after having pierced the *Pericardium,* have not either of them but one Line and a half Diameter: Nevertheleſs this Artery doth not produce any other Branch; all the Blood which enters from the Heart into its Trunk, is carried into the two Lobes of the Lungs, and no where elſe. The reaſon of ſuch Diſproportion I cannot gueſs; but this is matter of Fact, ſince it is the ſame in all: Nevertheleſs, if I may be permitted to conjecture, it ſeems to me that it may be attributed to the Alteration that happens to the Branches of the *Trachea Arteria,* when the Tortoiſe ſtretcheth forth his Head out of the Shell; for theſe Pulmonary Branches making an half Circle before they joyn with the *Trachea Arteria,* when the Animals Head is drawn in; the Extenſion which happens to the Branches of the *Trachea Arteria* when the Animal goes out of the Shell, turns theſe half Circles into ſharp Angles; inſomuch, that thereby the Paſſage of the

Blood is ſomewhat interrupted, and conſequently the Blood, which paſſes continually from the Heart into the Trunk, not being capable to return back, becauſe of its Valves, muſt of neceſſity dilate this Trunk more than the other Arteries, in which the Blood paſſes in an equal Paſſage. And that which perſuades me that there doth not go into the Lungs of this Animal, more Blood than that quantity which the Pulmonary Branches can admit by their ſmall Diameter, and not the quantity which the Diameter of their Trunk could furniſh, is, that the Pulmonary Veins, which bring back all the Blood of the Lungs into the left Auricle of the Heart, have not either of them entirely two Lines Diameter, which is proportionable to the bigneſs of the two Pulmonary Branches of the Arteries.

The ſecond Artery which goes out from the *Baſis* of the Heart, is that which I call *Aorta ſiniſtra*: It aſcends as it comes out of the Heart, together with the left Pulmonary, till they have pierced the *Pericardium*; after which it makes a large turning, without any ſupport, towards the left Side, which gives it the Liberty to extend it ſelf when the Animal ſtretches out of its Shell, and to refold it ſelf, when it retires into it; after that, this Artery deſcends againſt the Back, where it gives ſome ſmall Branches to the *Medulla Spinalis*; after that it returns through the Lungs into the *Abdomen*, and it is here that it produceth a conſiderable Branch, which divides into two; of which one is diſtributed to the Liver, the Stomach, and the Inteſtines, and the other turning towards the Right in the middle of the *Abdomen*, unites to the *Aorta dextra*; ſo that theſe two Arteries are but one and the ſame Branch divided into two. This ſame *Aorta ſiniſtra* continues afterwards to the lower Belly, to be diſtributed to the Kidneys, Thighs, and the Parts that are below. This left *Aorta* is much longer than the right, becauſe of the great Circle it makes when it cometh out of the Heart, to accommodate it ſelf to the Motions of the Animal, and to make room for its Head, which is placed under this Artery in the left Side, when he draws it into his Shell: And 'tis for that reaſon that the left Branch of the *Trachea Arteria* is longer than the right. This Artery is alſo bigger than the right *Aorta*, becauſe that it furniſheth a greater number of Parts with Blood. It hath a diſtinct Orifice into the Ventricle of the Heart, and hath not the leaſt Communication with the Pulmonary Arteries, neither in the Heart, nor any other Part. This does not reſemble at all to the *Ductus Arterioſus*, or as a certain Modern is pleaſed to call it, the Canal of Communication, in the Heart of an Human *Fœtus*.

The third Artery going out from the *Baſis* of the Heart of this Animal, is that which I call *Aorta deſcendens dextra*: After having pierced the *Pericardium* it ſinks towards the Back; then returning through the Lungs into the *Abdomen*, where it receives the Branch of the *Aorta ſiniſtra*, it is diſtributed to the right Kidney, Thighs, Bladder, and Parts of Generation: So that I call theſe two Arteries *Arteriæ Aortæ deſcen-*

deſcendentes, becauſe they diſtribute the Blood of all the inferior Parts of this Animal, the ſame as the *Aorta deſcendens* doth in all other Animals.

The fourth Artery going out from the Heart, is the *Aorta aſcendens*. It hath an Orifice in the Ventricle of the Heart, common with the *Aorta deſcendens dextra*: It appears in part under the *Aorta ſiniſtra* coming out of the Heart, and aſcendeth in a ſtrait Line till it hath pierced the *Pericardium*; after which it divideth into three principal Branches, whereof the two lateral go to the fore Legs, and make the Carotid; the third aſcends all along the *Trachea Arteria* towards the *Larynx*, and gives Branches to all the Parts of the Neck.

The Diſpoſition of the Arteries which go out of the Heart being examined, there remains only the Veins which bring the Blood into it from all the Parts of the Animal: But firſt one muſt obſerve, that there is no Veins which terminate in the Heart; for all the Veins open themſelves into the Auricles, which are, as hath been ſaid, ſeparated from the Heart. There are two ways to ſhow theſe Veins without Diſſection: The firſt is to fill them with Wax, by ſyringing it into them by their Orifices in the Auricles; for if one ſyringeth by the oblong Orifice in the *Auricula dextra*, all the Veins of the Body (except thoſe of the Lungs) will be entirely fill'd; and afterward by ſyringing into the Oval Orifice in the *Auricula ſiniſtra*, the two Veins of the Lungs will be full at once through the whole Extent of the *Trachea Arteria* in the Lungs. The other way is to wait till the Animal is expired; becauſe the Heart loſing inſenſibly its Vigour, (it beating for the ſpace of twenty four Hours,) it has not then the Force to diſcharge it ſelf of the Blood which comes from all Parts into theſe Veins, which then grow very turgid by the coagulated Blood collected in them: Then you need only to turn over the Heart towards the Neck, cutting only the little Coronary Vein which comes out of the Subſtance of the Heart, for to obſerve all the great Veins without Diſſection; becauſe they all come and end in a common Reſervatory, ſituated acroſs in the capacity of the *Pericardium*, joining to the Auricles. And here one may obſerve a great Vein, or an irregular Reſervatory: In the Tortoiſes I have diſſected of 18 and 20 Inches long, this Reſervatory was 10 Inches broad, and 18 Inches long. In this Reſervatory the two Axillary Veins which come from the upper Parts of the Body, joyn one another, after having pierced the *Pericardium*, one on the right ſide, and the other on the left. From the inferior Parts there joyn two large Veins, one on the right ſide, and the other on the left of the inferior Part of this Reſervatory; the firſt whereof is made up of all the Branches which come out of the right Lobe of the Liver, which is very big; and the other conſiſts not only of the Veins of the left Lobe of the Liver, but alſo of a Vein which ſupplies the place of the *Vena Cava*, and which I call the *Vena inteſtinalis*, becauſe after it has received all the Veins of the inferior Parts of the Animal, it runs all along the Inteſtines, from which it receives the Veins; and being arrived at the *Pylorus*, it paſſes croſs the Left Lobe of the Liver, and terminates in the common Reſervatory.

Beſides theſe four great Veins, there are three, and ſometimes but two, coming from the middle part of the Liver, which are inſerted into the bottom of the Reſervatory; as alſo the little Coronary Vein from the Heart. All theſe Veins being thus re-united in one common place, this Reſervatory terminates upwards in a Conduit, which is inſerted into the poſterior part of the right Auricle, and opens into its Cavity by an oblong Orifice, furniſhed with two long ſemilunar Valves, which permit the Blood of the Reſervatory to enter into the Auricles, but hinder its returning from the Auricles into the Reſervatory.

A little above the Reſervatory, under the left Auricle, the two Pulmonary Veins are ſeen: The left, after having entred the *Pericardium*, is hid under the axillary Vein, and does not ſeparate itſelf from it but a little above the Auricles; from thence it bends to go and inſert itſelf into the poſterior Part of the Auricles. The right Pulmonary Vein follows after the ſame manner the right Axillary, which it quits after it has entered the *Pericardium*, to traverſe almoſt all the length of the Reſervatory, and meet the left Pulmonary about two Lines diſtance from the Auricles. Theſe two Veins thus united, open themſelves in the poſterior Part of the *Auricula ſiniſtra*, by a common Oval Orifice furniſhed with two Semilunar Valves; by which means they pour into this Auricle all the Blood that comes from the Lungs to the Heart.

By all that has been obſerved upon the Structure of the Heart of the Land Tortoiſe of *America*, and the Diſpoſition of both its Auricles and Veſſels, how extraordinary ſoever it may appear, it is impoſſible to find out the leaſt thing which may injure the Opinion of Dr. *Harvey*, and all other Anatomiſts, about the manner that the Blood circulates in the Heart of an Human *Fœtus*, and the uſe of the Valve which is at the *Foramen Ovale*; which is to permit the Blood to paſs from the right Auricle through this Hole into the left, and to hinder the Blood's paſſing from the left Auricle by this Hole into the right. And I add farther, that amongſt all the known Animals, one could not chuſe one whoſe Heart may be more proper to confirm this Opinion, than the Land Tortoiſe of *America*, by reaſon of the Simplicity of its Structure, and of the plain and diſtinct manner in which all the Parts appear.

An Explanation of the Figures. *Plate* 14.

Fig. 1. *a a a* The Heart. *b b b* Its Auricles. *c* The Trunk of the Pulmonary Artery. *d* The *Arteria Aorta deſcendens ſiniſtra*. *E* The *Arteria Aorta ſuperior*. *H* The *Arteria Aorta deſcendens dextra*. *F* The Ligament that ſuſpendeth the Cone of the Heart in the *Pericardium*. G G G G The *Pericardium* opened.

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Plate XIV. Part III. P. 356.

Fig. 1^{a}.

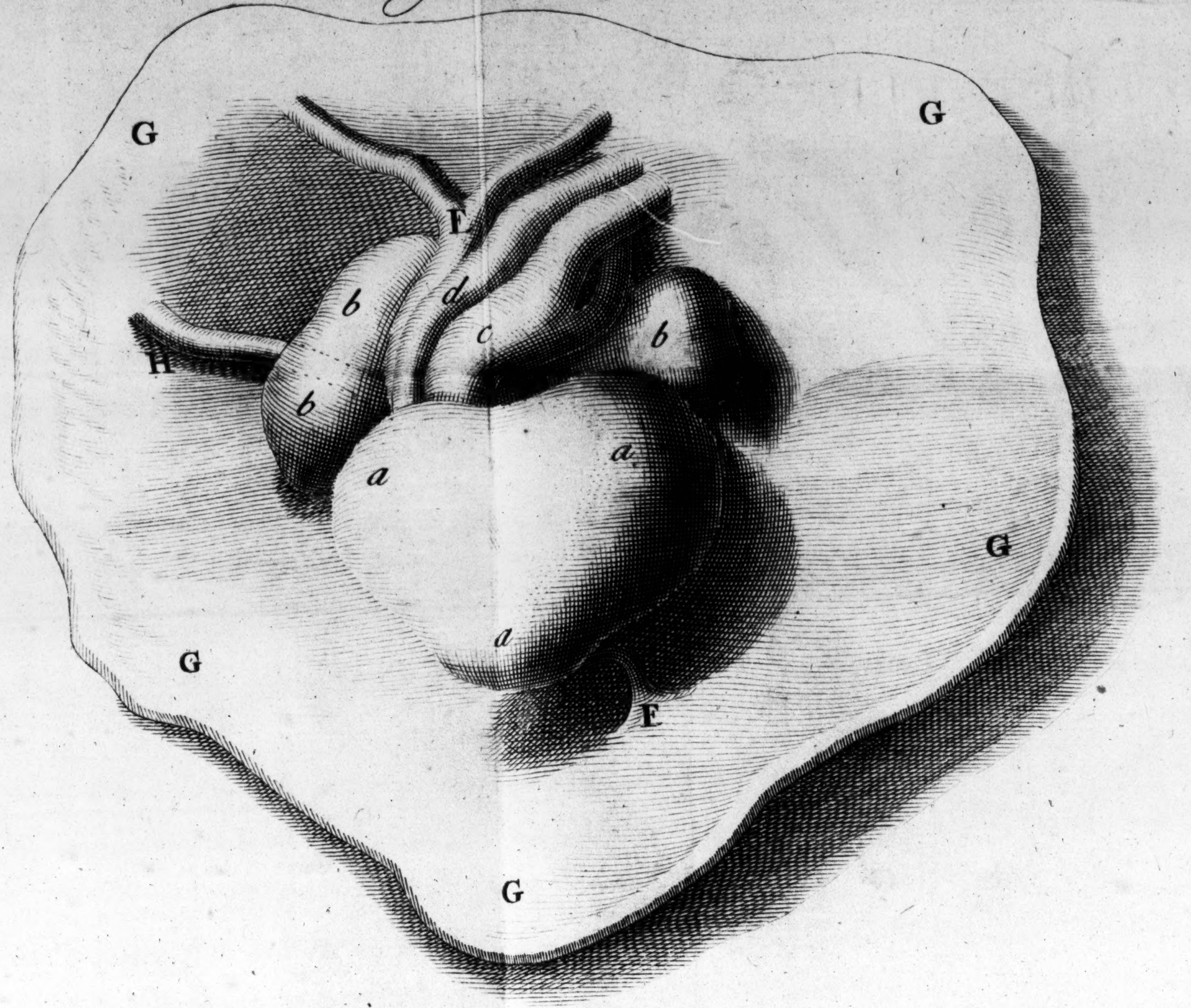
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Fig. 2^{a}.

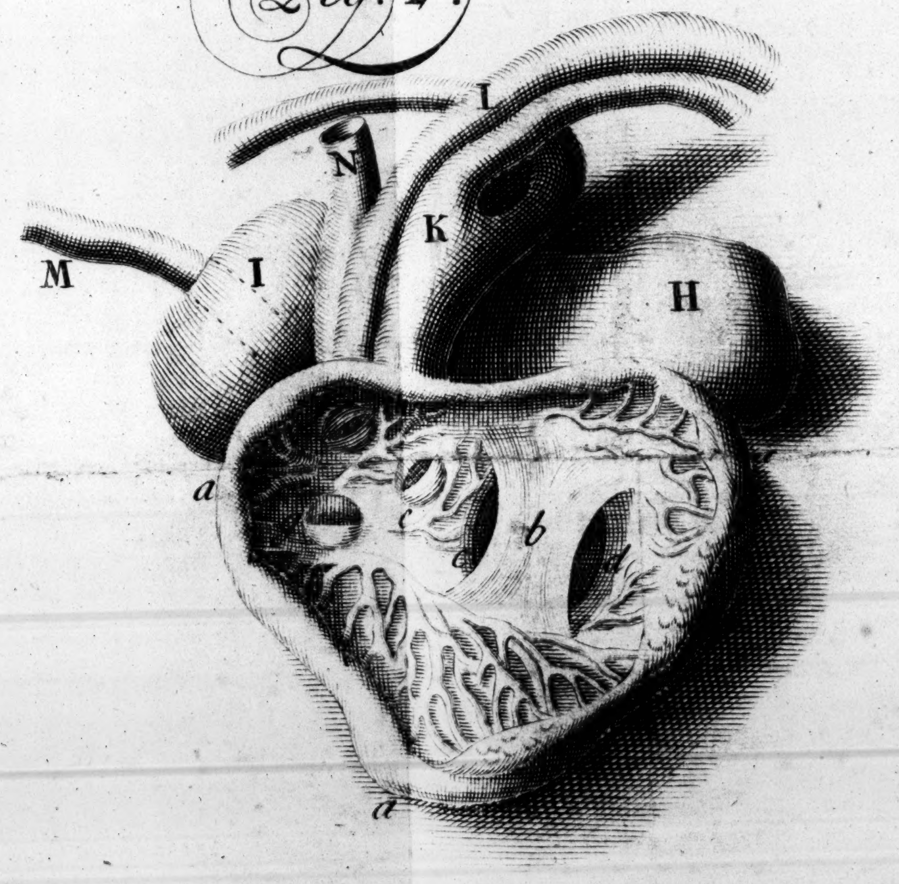
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Fig. 3^{a}.

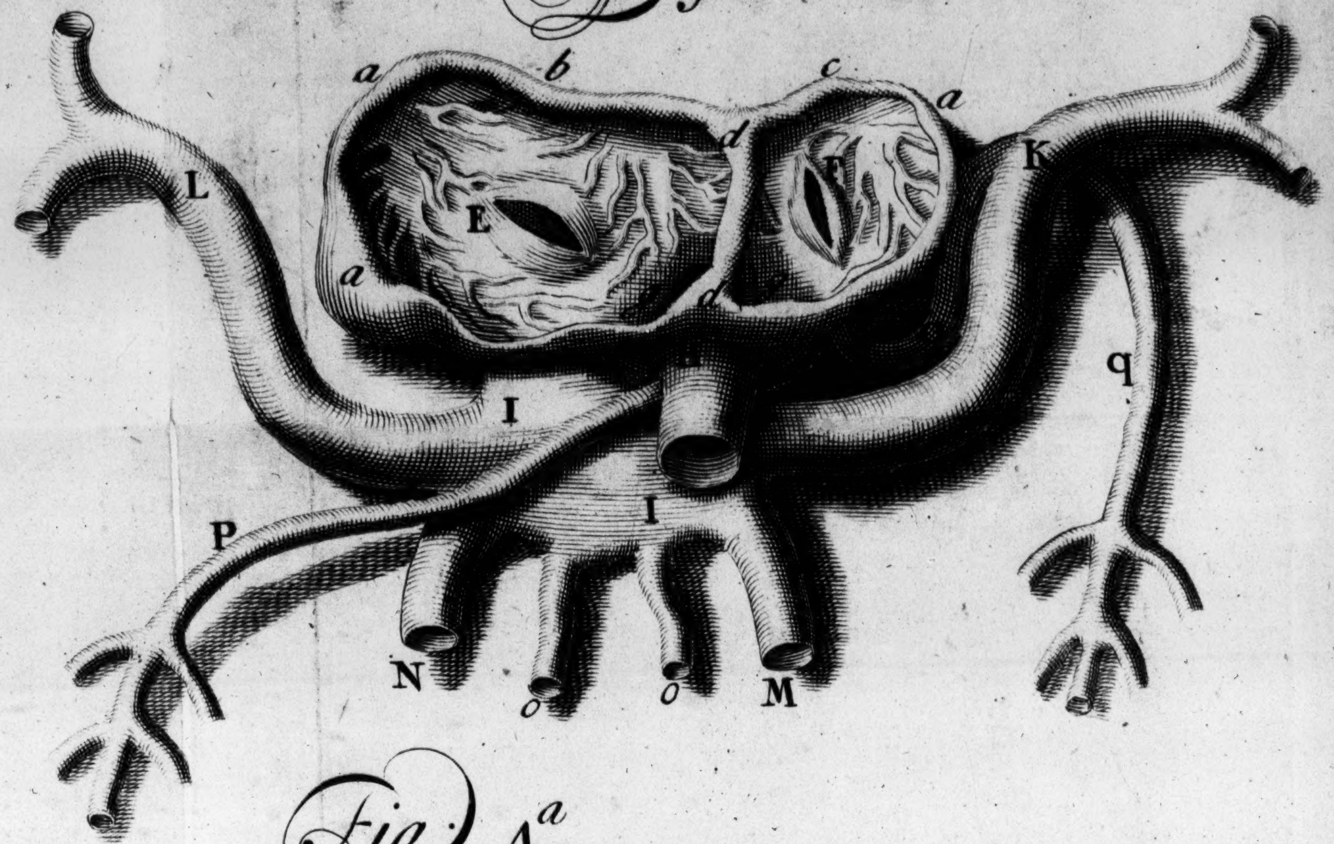
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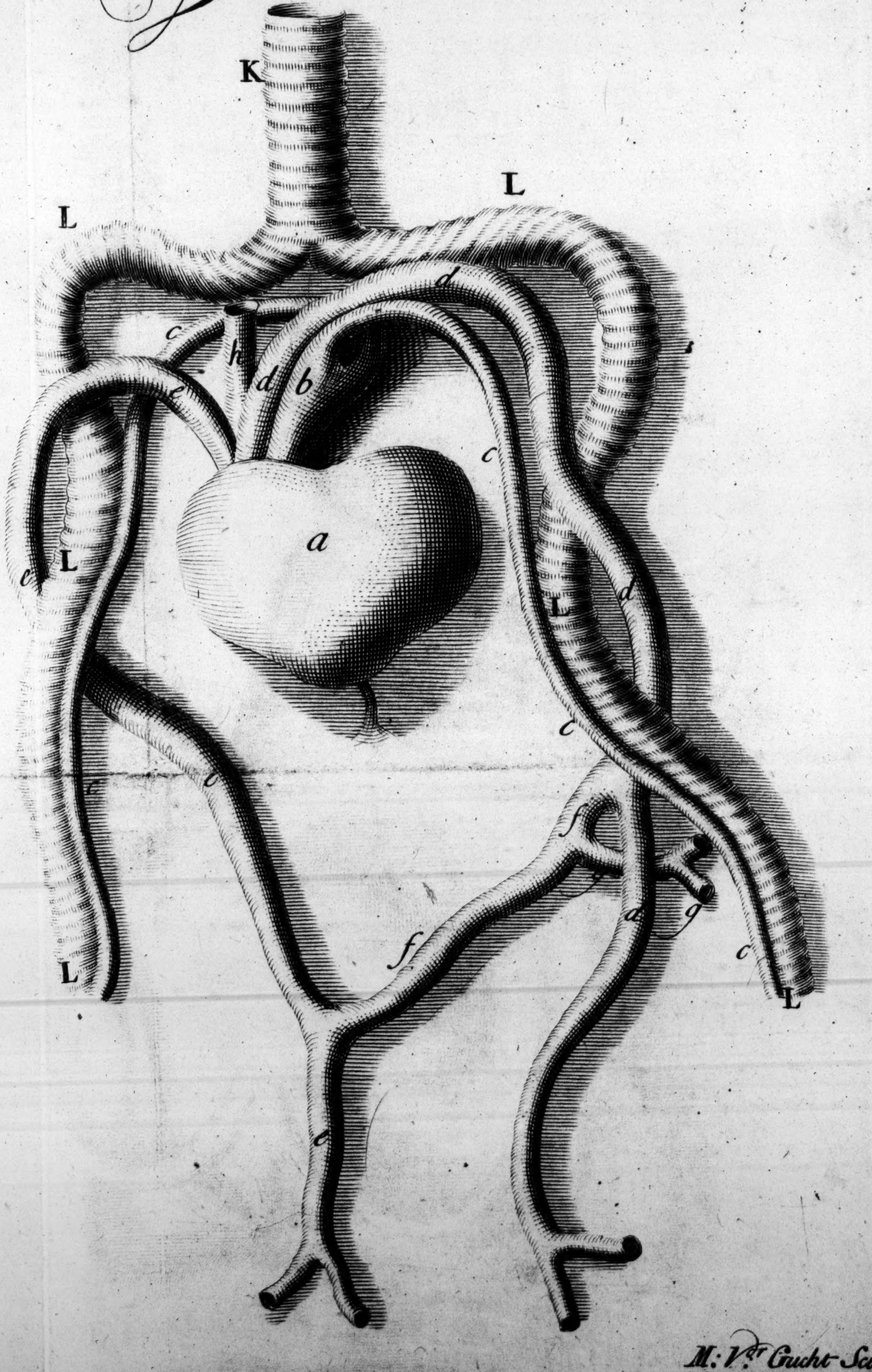
Fig. 4^{a}.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M: V^{dr} Gucht Sculp:

Fig. 2. *a. a. a.* The Heart opened to ſhow the Parts of its Ventricles. *b.* The double Valve covering the Orifices of the *Ductus's* from the Auricles. *c.* The Orifice of the Right Auricle *i.* *d.* That of the Left *H.* *e.* The Orifice of the *Arteria Pulmonalis K.* *f.* That of the *Aorta ſiniſtra L.* *g.* The Orifice common to both the *Arteria Aorta dextra M.* and the *Aorta ſuperior N.*

Fig. 3. *a. a. a.* The Auricles. *b.* The Right Auricle. *c.* The Left Auricle. *d. d.* The Muſculous *Septum* that divides the Cavities of the Auricles. *E.* The Orifice of the *Reſervoir* of the Veins. *F.* The Orifice of the Pulmonary Veins. *g. g.* The large part of the Funnels. *H.* The Muſculous *Ductus* of the Funnels. *i. i.* The *Reſervoir* of the Veins. *K.* The Left Axillary Vein. *L.* The Right Axillary Vein. *M.* The great inteſtinal Vein. *N.* The great Hepatick Vein. *o o.* Two ſmall Hepatick Veins. *P.* The Right Pulmonary Vein. *q.* The Left Pulmonary Vein.

Fig. 4. *a* The Heart of the *Tortoiſe.* *b.* The Trunk of the *Arteria Pulmonalis.* *c. c. c. c.* The Branches of the *Arteria Pulmonalis,* accompanying the *Bronchia* in the Lungs. *d. d. d. d.* The *Arteria Aorta deſcendens ſiniſtra.* *e. e. e. e.* *Arteria Aorta deſcendens dextra.* *f. f.* One Branch of the *Aorta ſiniſtra,* which communicates with the *Aorta dextra.* *g. g.* *Arteria inteſtinalis.* *h.* *Arteria Aorta ſuperior* or *aſcendens.* *i.* The Ligament that ſuſpends the Heart. *K.* The *Trachæa Arteria.* *L. L. L. L.* The two Branches of the *Trachæa Arteria* going to the Lungs.

A Pin in a Fowl's Gizzard by Mr. Regnart. *n.* 301. *p.* 2055.

XVII. In cutting the Stomach or Gizard of a Fowl, finding ſomething reſiſted my Knife, upon examining it farther, I diſcover'd it to be a Pin, which the Pullet had ſwallowed, and in all probability had lain in her ſome time: For it had pierced thro the Membrane on the inſide, and made a paſſage into the thick part, where it had form'd itſelf a Bed. It is obſervable that the head of the Pin had paſt thro the firſt ſhrivell'd Membrane, but ſtopt at the ſecond, which ſeem'd more thick and Nervous; ſo that the Head remain'd incloſed betwen the two Membranes, the Body of it having made its way into the fleſhy Muſcular part. At the point there was form'd a *Callus,* of the bigneſs of a ſmall Pea, which ſeem'd a defence, that Nature had made to oppoſe it, as it was working itſelf farther.

The Wood Peckers *Tongue*, *by* Richard Waller *Eſq*; *n.* 350. *p.* 509.

XVIII. That the *Picus Martius* or Wood-Pecker makes a round Hole even in ſound and hard Trees, ſuch as the Oak, Horn-beam, Beech and the like, is commonly obſerved; and that within theſe Holes, the Hollow being enlarged, the Neſt is made, the Eggs laid and Hatch'd; and the young Brood fed, as by other Birds. For this purpoſe, that he may be enabled to perform ſuch hard work, the Muſcles of his Neck, Breaſt, and Thighs, are exceeding ſtrong in proportion to the bigneſs of the Bird: he has alſo a very firm ſtrong ſharp Bill, his Legs are ſtrengthned with very ſtrong Tendons; and his Toes, which are two before and two behind, (as it is in ſome other Birds) are provided with ſharp ſtrong hooked Claws or Talons: Beſides this, his Tail conſiſts of ten very ſtiff large and ſtrong Quills, firmly ſet into a robuſt ſtrong *Uropygium* or Rump; ſo that when he has faſtened his Claws and Feet into the Clefts and Inequalities of the Bark of the Tree, he claps his ſtrong Tail-Feathers againſt the Body of the Tree; and ſo ſtands with his Head erect, to give the ſtrokes with his Bill with the greater Force.

That he is of the Inſectivorous kind is certain, and lives not only upon Inſects catcht creeping on the outſide of Trees, but alſo on ſuch as are under the Bark between the Bark and Wood, as likewiſe on thoſe in rotten Wood; and as I am very confident on Worms and other Inſects in the Ground: for I have frequently obſerved the Roots of their Bills very dirty, as it is in *Crows* and *Rooks*, *&c.* Whence I ſuppoſe he ſtrikes his long ſharp Bill into the ſoft Earth to take the Worms out of it. I have alſo found their Craws full of ſmall Ants. This Bird is known to throw out a long, ſlender, round Tongue, to a conſiderable diſtance beyond the End of his Bill; and to draw it in again very quick into his Mouth or Bill, with the caught Inſect ſpitted on the Tip of it.

The *Chameleon* indeed darts out its Tongue to a conſiderable length; and having intangled the Fly in the glutinous Matter at the End of it, draws it into its Mouth, together with the Prey; but the Mechaniſm in that Animal is wholly different from that of the preſent Subject: as may be ſeen by the Account the Gentlemen of the *Academy Royal* give thereof, in their *Memoirs* for a Hiſtory of Animals. The Protruſion therefore of the Tongue to the length even of three or four Inches in this Bird, being very extraordinary, and the Mechaniſm of the ſeveral Parts for that end no leſs Curious; ſeveral learned Enquirers have attempted to explain it; but I am of opinion they have been, in ſome Particulars at leaſt, miſtaken. I ſhall mention ſome of theſe.

Monſ. *Perault* deſcribes it after this manner*. This long Tongue he throws out by the means of two ſmall bony Cartilages, about ſeven Inches long, and of the thickneſs each of a middling Pin, which are perfectly Smooth and Slippery. Theſe two Cartilages are united at the End, and being in this place covered with Fleſh make the fore-part of the Tongue. The reſt of theſe Cartilages are ſeparated from each other, and paſs turning round under the Ears; and then riſing up behind the Head, where they meet again, they paſs over the Top of the Head, and ſo extend themſelves to the Root of the Beak. Theſe Cartilages which make the hinder part of the Tongue, are alſo incloſed in a Channel Fleſhy on the out-ſide, and whoſe inſide is covered with a very ſmooth ſlippery Membrane. Now theſe Fleſhy Channels, which incompaſs and keep in theſe Cartilages, are the Muſcles by which the Tongue is moved: for having their origine at the *Larynx*, and their inſertion at the extremities of the Cartilages, it comes to paſs, that when thoſe Muſcles of the two Fleſhy Channels, which make the hinder

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** Eſſays de Phyſique*, Tom. 3. Part 2. p. 148.

hinder part of the Tongue are ſhortned, they force the fore-part of the Tongue out of the Beak, by drawing the poſterior or fartheſt end nearer to the *Larynx*: and on the contrary, when the Fleſhy Channel, which makes the anterior Part, acts, it draws the fore part of the Tongue into the Bill towards the *Larynx*. This Mechaniſm of making a hard part, ſuch as the bony Cartilages are, to come out and return into another, ſuch as the Canals are, by the means of Cords drawing them, which are the Muſcles, is made uſe of in Coaches to pull up the Glaſſes of the Doors; for the String being faſten'd to the lower part of the Glaſs-Frame, makes it riſe when drawn, which reſembles that Action of the Muſcles by which this Tongue is moved. Of theſe Cartilages and other Parts, and of the Head of the Bird, Mr. *Perault* gives the Figures

Either the Wood-peckers in *France* are different from ours in *England*; or this Figure of the Head is very ill deſigned; it being much too broad and large, and the Beak too ſhort. Beſides he makes the 2 Cartilages to come to the Root of the Beak ſeparately, one on one ſide, the other on the other ſide of it; whereas in all the Wood-peckers Heads I have met with, the two Cartilages joyn cloſe together about the Top of the Head, and thence proceed joyned, though not faſtned to one another, a little ſlanting towards the right Noſe-hole, where they end together. Beſides upon viewing and examining ſeveral Subjects, I could not find them agree in divers Particulars with his Account and Explication. For the Muſcles which are faſtned to the end of the Cartilages at the Root of the upper Beak, are not inſerted at the *Larynx*, but paſs on and are faſtened to the lower Bill. This pair I take to be the Muſcles chiefly concerned in forcing the Tongue out of the Bill. There is another pair of Muſcles, which being faſtned to the place where the two bony Cartilages are articulated with one ſingle Bone in the fore part of the Tongue, (as will be ſhewn in the fourth Figure) is, as I apprehend, the chief pair concerned in the drawing the Tongue with its Prey into the Mouth. Theſe proceeding from that Articulation of the Cartilages as far as the *Larynx*, (each of them ſending a Branch to the *Cartilago Scutiformis*) from thence go on along with the Neck, (though not faſtned to it) till they come within the Cavity of the *Thorax*, where they are inſerted under the *Clavicula* or *Merry-thought bone*, as 'tis called. This pair is repreſented by *kk* in the ſecond Figure; and by *q q* in the Firſt.

Plate 15.

There is likewiſe a very ſlender white Thread, (whether Tendon or Nerve, I am uncertain) which accompanies this Muſcle its whole length; and which drawn gently (for fear of breaking) pulls in with it the end of the Tongue. As there is ſuch another all along the *Vagina* to the End at *c*.

Volker Coiterus, as he is mentioned by *Gerard Blaſius*, * treating of the Tongue of this Bird, makes it to be made of three ſlender Bones, round, and as he ſays bound together, (*invicem colligatis*) which is a Miſtake;

* *Anat. Anim.* *Cap.* 24. *p.* 64.

Miſtake; for though reckoning the two bony Cartilages for *Oſſicula*, yet the third is not bound up with them, but articulated to the End of them. The ſame Perſon ſays the Tongue may be thruſt out to the length of an Inch and a half, whereas when drawn in, it is ſcarce an Inch long; when in reality it may be thrown out near four Inches; and I believe cannot be drawn in, ſo as to be leſs than an Inch and a quarter, *viz.* to that place where the two Cartilages are articulated with the ſingle Bone. Beſides he makes the uſe of the long flat Muſcle running over the Top of the Head, to be (if I rightly apprehend his meaning) to draw the Tongue to the upper Jaw, whereas their uſe is for thruſting the Tongue out of the Bird's Mouth. But this Perſon, having given no Figures, has rendred what he ſays leſs intelligible; though indeed he mentions two pair of Muſcles, as there are ſo many chiefly concerned, yet there are at leaſt two other Pair, that aſſiſt the Performance.

† *De Mot. Anim. Part* 2. *p.* 24.

Alphonſus Borellus † makes the pair of Muſcles concerned in thruſting the Tongue out, to be faſtned indeed as they are to the lower Beak towards the Point; but then he makes their Inſertion at the other End to be at the Extremities of the *Oſſa Hyoïdea*; whereas they really reach to the very End of the long Cartilages that go round the Head: Theſe, by another Miſtake, he makes to be the Retractors of the Tongue, and joins another Pair as Aſſiſtants in the ſame Action, which he makes to be twiſted ſpirally about the *Trachea*. None of all which agree with the Subjects I have met with, as will be ſeen by the Deſcriptions of my Figures.

Hiſt. Acad. Roy. Sc. an. 1698. *l.*4. *c.*5.

Monſ. *Mery* differs from both *Perault* and *Borelli*, taking the Horny End and Bone to which it is joined, to be only the Tongue properly ſo called, and that the next two Bones anſwer the *Hyoïdes* with the long Cartilages annexed to them. But even in this he ſeems to me not to be ſo clear; confounding, as I apprehend, the two Bones with the Cartilages. He deſcribes the *Vagina*, in which the Bones and part of the Cartilages are encompaſſed, and which is faſtned to the Horny end, and is protruded and drawn back with the Tongue: He takes notice of the little ſharp Points or Prickles on the horny Part being moveable, and with their Points bending towards the Throat; but I apprehend it is a Miſtake to make the Mucous Matter Glutinous which is furniſhed by the two *Pyramidal Glands*; for I take the uſe of that *Mucus* to be chiefly, if not only, to lubricate the paſſage in the *Vagina*, for the more eaſie ſlipping of the Cartilages therein. He deſcribes the Muſcles for exerting the Tongue, and extends them from their Inſertion at the lower Beak, to the End of the ſpringy Ligaments, as he terms what I call *Cartilages*; to which he adds another ſmall Ligament capable of Extenſion, at the end of the other two next the Noſe, which, when the Tongue is thruſt out, is relaxt and ſtretch'd. He alſo deſcribes the pair of Muſcles faſtned to the Root of the Tongue and *Os Hyoïdes*, ſerving to draw the Tongue into the Mouth: Theſe he makes

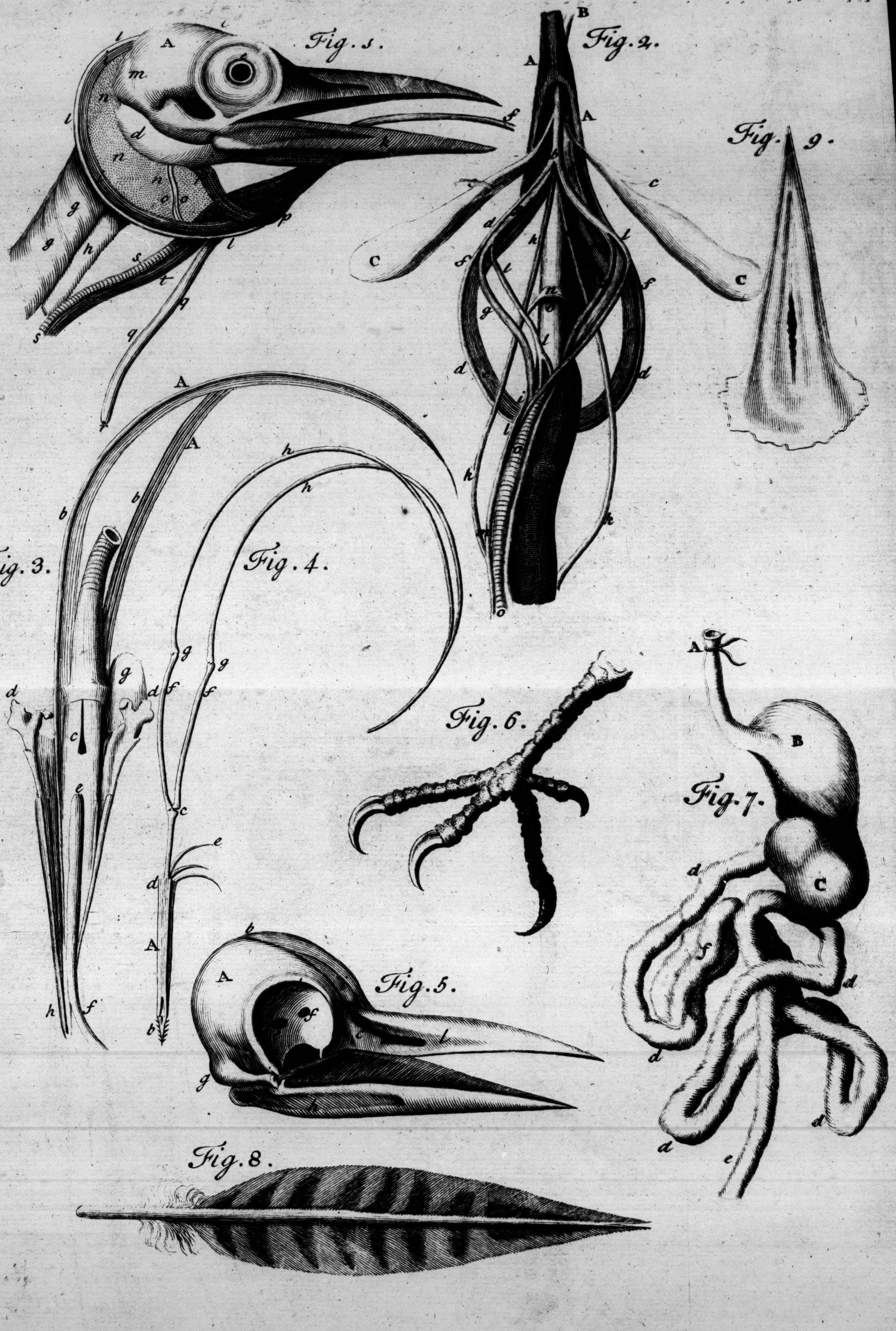
Fig. 1.
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Fig. 9.
Fig. 3.
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Fig. 6.
Fig. 7.
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Fig. 5.
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Fig. 8.

M. Vdr Gucht Sculp.

makes to be wound round about the *Aſpera Arteria* once or twice, in which I think there is ſome Miſtake; being of Opinion, the Mechaniſm for this Action of drawing in of the Tongue is different from what is here deſcribed, as in the Explication of the Figures I ſhall endeavour to ſhew. But not to inſiſt on all the Particularities mentioned in this Deſcription, which for want of more Figures to explain the ſeveral Parts in ſo curiouſly contrived an Organ, is not ſo clear as might be deſired (there being but one, and that a wooden Cut of the Head, Tongue, Bones, Muſcles, *&c.*) I ſhall now proceed to the Explication of the ſeveral Draughts I made, with what Exactneſs and Care I could, in 8 or 10 ſeveral Subjects.

FIGURE the Firſt.

Repreſents the Head with Part of the Neck of this Bird, the Skin being taken off, in which, *Plate* 15.

A The Scull, having two ſhallow Grouves or Channels, or rather one broad one with a ſmall Riſing in the midſt, on the *Sinciput* or back Part, from each ſide of the Neck to the Top of the Head, where they unite into one, which paſſes ſlanting towards the right Side, and ends at the Hole for the Noſtril on that ſide at *c*. *b* Is the Hole or Paſſage for Hearing. *d* A large white Gland, containing a glutinous Liquor almoſt like Cream as to Colour and Conſiſtence, which empties itſelf into the Mouth; I ſuppoſe to lubricate the Cartilages. *e* The Eye, which has a bony Ring, encompaſſing the *Iris*. *f* Part of the Tongue, which in this Figure is repreſented as almoſt all drawn into the Mouth, of which more when I come to deſcribe the Cartilages, *&c.* in the ſecond Figure. *g* Part of the Neck, which is large and furniſhed with very ſtrong Muſcles. *h* The *Oeſophagus*, opening very wide at the *Fauces*, and wholly Muſculous. *i i i* A long, but thin and flat Muſcle in reſpect of its breadth, which is about $\frac{1}{8}$ of an Inch, reaching from the end of the Cartilage at *c*, to the under Bill or Beak at *k*, to the inſide of which it is very firmly faſtned; as is ſuch another on the other ſide. *k* The under Bill very ſtrong and ſharp pointed, articulated with the Scull a little behind the Ear-hole *b*. *l l l* The Cartilage on one ſide, the other being exactly the ſame. This Cartilage is round, very ſmooth, even and ſlippery, about the ſize of a pretty large Pin; and reaches, when the Tongue is drawn in and the Muſcle *i i* relaxed, from the Root of the upper Beak at *c*, to the Root of the Tongue properly ſo called, or to the Bones of the Tongue where they are articulated, being bent like a Hoop, as in the Figure, ſlipping very freely in a Sheath or Membranous *Ductus* faſtned on the outward or Convex Edge of the flat Muſcle *i i i*, which Muſcle accompanies it from its end at *c*, almoſt to the end of the Canal or Sheath, which opens at a Hole a little before the *Larynx*; (as will be ſhewn in the third Figure) and thence the Muſcle proceeds to its Inſertion into the lower Beak at *k*. From the Concave Edge of this Muſcle, there is a thin and tranſparent but very ſtrong Membrane, ſtrained like a Drum-head to the Scull at *m*, where it is very ſtrongly faſtned; this Membrane is furniſhed with Capillary Veins and Arteries, and doubtleſs is Nervous. *n n* repreſents this Membrane. This Cartilage, when the Tongue is exerted, parts about half an Inch from the Root of the Beak at *c*. *o o* A pretty large Vein and Artery. *p p* A Muſcle reaching from one Jaw to the other, under the Throat; ſerving as a Bandage to keep in the Cartilages, and the Root and *os Hyoïdes* of the Tongue, as I may call it, from ſtarting out at that Part where are the Articulations of the Cartilages with the Bones, when by the Muſcles, inſerted into the Sheath at or near *p*, and thence paſſing to the end of the Tongue, it is drawn into the Mouth. *q q* One of the laſt mentioned Muſcles, which is round, of the ſize in the Figure, and faſtned to the Breaſt of the Bird, cut off at *r*. *s* The *Aſpera Arteria* conſiſting of perfect Rings. *t t* A Muſcle accompanying the *Aſpera Arteria.*

FIGURE the Second.

A A The under Part of the lower Bill. *B b* The Tongue. *b* The Place where the two Cartilages and two Bones repreſented by *f f*, in Figure 4. are brought into and incloſed in one Tube or membranous Sheath. *C C* Two Glands diſplaced in this Figure. *c c* Two Muſcles attending theſe Glands, and faſtned near the end of the Bill. *d d* The two bony Cartilages, bent, and paſſing on each ſide of the Neck, but united at *b*. *e e e, e e e* The pair of Muſcles, one attending each Cartilage, from the end of it at the upper Beak, and firmly adhering to the *Vagina*, in which it ſlips, till about *f f*. *f f* The place where theſe Muſcles leave the *Vagina*, and paſs on to the inſide of the Bill, where they are inſerted. Their Action is to thruſt the Tongue forward, or out of the Mouth. *g g* A pair of Muſcles faſtned a little below the *Larynx*, to the muſculous Part of the *Aſpera Arteria*, at *i*; the other end of them going up to the place *b* at the Root of the Tongue, whence they go on encompaſſed by the *Vagina* to the Articulation of the Cartilages with the two Bones. I take their Action to be to draw the end of the Tongue towards the *Larynx*. *k k* Two Muſcles faſtned at one end within the *Thorax*, under the Merry-thought or *Clavicula*; and at the other Ends to the Articulation of the Cartilages with the two Bones of the Tongue, marked *f f*, in Fig. 4. Theſe have the forementioned Nerves accompanying them. I take theſe to be chiefly concerned in drawing in the Tongue; each of theſe ſends a Branch to the Griſle at the Top of the *Aſpera Arteria* at *n*. *l l l l* Two Muſcles running along and faſtned to the Sides of the *Aſpera Arteria*, from the *Thorax* to the Place where they are united, where each of them ſends a Branch; which binding over the Bones and Cartilages goes on to the *Fauces*, where they are inſerted. *m* Part of the *Gula*. *n* A Cartilage at the Top of the *Aſpera Arteria*. *o o* The *Aſpera Arteria*. *p* The Neck bending like an *S*. The Wind-pipe and *Gula* in this Bird paſs always on the right ſide of the Neck.

FIGURE the Third.

A A The two long flat Muſcles repreſented by *i i*, in the firſt Figure. Theſe join cloſe to one another at the Top of the Head, and ſo paſs on together to the end of the Cartilages; to the end of which, as I take it, they are faſtned: from whence a ſlender weak kind of Ligament reaches to, and is inſerted at, the right Noſe-hole, at the Root of the upper Beak. This Ligament is relaxt when the Tongue is thruſt out. *b b* The Cartilages running in their *Vagina* on the outſide of the ſaid Muſcles. *c* The *Larynx* or paſſage to the *aſpera Arteria*. I obſerved no *Epiglottis*. *d d* Two Articulations or Joints in the under Beak or Bill. *e* The Hole or Paſſage, whereby the Tongue in its *Vagina* comes out and is drawn in again. *f* What I call the Tongue, in the inſide of which the two Cartilages are brought together, till they are both articulated to one ſingle Bone, at the end of which is the horny barbed Tip. *g* One of the Pyramidal Glands. *h* The lower Bill.

FIGURE the Fourth.

A That Part which I think may moſt properly be called the Tongue; a ſmall Bone running through it: This, as far as *c*, is flat and thin at the ſides. It is cut away at *d*, to ſhew the Bones within it. *b* The horny Tip of the Tongue, about a quarter of an Inch long, ſtrong and ſharp, furniſhed with four or five Barbs on each ſide; (not with an infinite Number, as *Coiterus* ſays) Theſe Barbs are ſharp and moveable, like the ſmall Teeth at the Root of the Tongue; and beginning of the *Gula*, in the Pike and Jack-Fiſhes, in that of Eagles and the like; ſo as to let the Prey ſlip eaſily on, but not ſo eaſily get off again. *c* The end of the Bone of the Tongue where the two bony Cartilages are articulated. *d* The place where the upper part of the Tongue is cut away to ſhew the Bone. *e* Several ſmall Tendons, or rather, as I take them to be, Nerves running thro' the Tongue. Of theſe ſome go to the end of the Cartilages, others accompany the Muſcles to the Neck. *f f* Two Bones or Cartilages, which in the Bird are united by a thin Membrane, as far as the next joynt, ſo as to open aſunder to ſome diſtance, but not to ſeparate quite. Theſe two Bones ſeem to anſwer to the *oſſa Hyoïdea* in other Creatures. At the place marked *g g* the Muſcle that draws the Tongue into the Mouth is faſtned, or rather leaves the Tongue at that place; it having its Inſertion near to the end of it: This Muſcle is repreſented by *q q*, in the firſt Figure. *h h* The two bony and ſpringy Cartilages running on each ſide of the Neck; which being joyned cloſe together on the Top of the Head, paſs ſo joyned to the Noſtril, or Noſe-Hole on the right ſide. From the Conſideration and comparing of theſe four Figures, the true Mechaniſm and Motion of the Tongue, ſeems to be in ſhort thus: The two long Muſcles inſerted near the

End of this lower Beak, and reaching to the End of the Cartilages, being contracted, the round Hoop of the Cartilages is drawn up, from each ſide of the Neck, cloſe to the Pyramidal Glands; and at the ſame time the Muſcles that draw the Tongue into the Mouth being relaxed, and the Articulations at *c* and *g g* in the fourth Figure, brought near to a ſtraight Line, the Tongue is thrown out to the length of four or five Inches. But when thoſe long Muſcles are relaxed, the pair of Muſcles repreſented by *k k*, in the ſecond Figure, being contracted, draw the Articulations *g g* where they are faſtned, down into the Throat or wide looſe Skin of the Neck; and at the ſame time the Cartilages opening into a wide Hoop, the whole Tongue is drawn into the Mouth.

FIGURE the Fifth.

A The Scull. *b* The ſhallow *Crena* or Groove, for the Cartilages. *c* The Place of their Ending at the right Noſe-Hole. *d* The Orbit of the Eye. *e* The Hole for the Optic Nerve. *f* A Hole or Paſſage through from one Orbit to the other. *g* A Bone covering the Hole to the Ear. *h* The lower Jaw and Bill. *i* A Ridge or *Proceſſus* in the Scull, beginning at the Root of the upper Bill, and keeping the two Ends of the bony Cartilages in their place on the right ſide. *k* The *Os Jugale*. *l* The upper Bill.

FIGURE the Sixth.

Repreſents the right Leg and Foot in which there are two *Digiti* before, and two behind. The Strength, Largeneſs, and Sharpneſs of the hooked Claws or Talons are remarkable.

FIGURE the Seventh.

A The *Oeſophagus*. *B* The *Ingluvies* or Crop, partly muſculous, and lined with a glandulous Coat. This I found quite filled with ſmall black Piſmires; as alſo *C* The *Ventriculus* or Gizzard, which joyned cloſe to the *Ingluvies*. *d d d* The Inteſtines nearly of the ſame bigneſs for the whole Length. *e* The beginning of the *Rectum*. *f* The *Pancreas*.

FIGURE the Eighth.

One of the middle pair of Feathers of the Tail, in which the great Strength of the Quill for ſo ſmall a Feather, and its bifurcate End, are very remarkable.

FIGURE the Ninth.

The Roof of the Mouth, where 'tis obſervable, that the *Rima* or Paſſage for the Air to the Noſtrils, is beſet on each ſide with a Row of 10 or 12 little ſharp Teeth, with their Points ſtanding inwards, towards the *Gula*. Theſe take the Prey from the end of the Tongue whoſe Barbs or Prickles are moveable, and are to keep it from going out of the Beak again with the Tongue, and from hence it is conveyed to the Swallow.

The Natural Hiſtory and Deſcription of the

XIX. *Nomen*. It was the famous Comical Poet *Ariſtophanes*, that firſt (*a*) makes mention of this Bird by the Name of Φοινικόλοφος and

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(*a*) *Ariſtoph. Aves. Sc.* 4.

Phœnicopterus *or* Flamingo, *by* *Dr.* Douglaſs, *n.* 350. *p.* 523.

and not long after it is called ὄρνις φοίνικος (*b*) by *Philoſtratus* in his Life of *Apollonius Tyaneus*. *Apicius*, *Plinius*, *Suetonius*, *Juvenal*, and other Latin Writers retain the Greek Word, and call it *Phœnicopterus*. *Bellonius* (*c*) ſays, that in French it is named *le Flement* or *Flambant*. *Scaliger* affirms, that in *Provence* they call it *Flammant*: And (*d*) *Geſner* ſays it may be called *Avis Rubra* per excellentiam. (*e*) *Aldrovandus* writes, that in *Sardinia* it goes by the Name of *Fiamingo*; and *de Laet* tells us, the *Spaniards* in the *Weſt-Indies* call it *Flamenco*. Dr. *Charlton* and Dr. *Grew* convert the Greek Appellation into Engliſh, naming it the *Phœnicopter*: And Sir *Hans Sloane*, in his Catalogue of *Jamaica Birds* annexed to Mr. *Ray's Synopſis Avium*, ſtiles it the *Flamingo*. (*f*) *Du Tertre* calls it *le Flamand*, which differs but little from the Name given it by *Bellonius*: And to mention no more, (*g*) *Du Hamel* ſays 'tis commonly call'd *Becharu* in *France*.

Etymologia. All theſe differing Names may be eaſily accounted for, from the Colour moſt prædominant in its Wings. Thus *Martial* (Epigram 58. Lib. III.) ſays of this Bird:

Nomenque debet quæ rubentibus pennis.

And again (Epigr. 71. Lib. XIII.) he makes it give the true Derivation of its own Name;

Dat mihi penna rubens nomen.

The Greek Name is compounded of two, *viz.* φοίνικος, *puniceus*, *ruber*, and πτερὸν, *Ala*, a Wing, *quod ſit rubentibus Alis*; which thing in different Words is expreſt as follows, by the ſeveral Authors I have conſulted. *Bellonius* ſays 'tis called in French *Flambant*, not only from the Date Colour of its Wings, *à Dactylorum colore*, i. e. a Scarlet or light red, like the Fruit of the Palm or Date-Tree called in Greek φοῖνιξ; but alſo from the Luſtre of the Colour reſembling Flame: or as *Aldrovandus* has it, *quod velut ignis inſtar ejus rubedo emicet*. The Words of *Geſner* are, *Ego Gallicum nomen à rubro & flammeo roſtri, crurum, pennarumque in aliquibus partibus colore inditum eſſe conjecerim: aut forte quoniam ex Flandria hyeme ad* Narbonenſis *Provinciæ maritima volat; nam Flandrum Galli* Flammant *appellant: vel à corporis proceritate, quales ſolent eſſe Flandri*. Mr. *Willoughby* (*h*) ſays the *French* name it thus rather from the flammeous Colour of the Wings and Feet, than that it comes in the Winter Time from *Flanders*. For he believes there was ſcarce ever ſeen in *Flanders* a Bird of that kind; ſo far are they from being

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(*b*) *Philoſt. Lib.* 8. *Pag.* 387. *Edit. Paris.* 1605. *fol.* (*c*) *Bellon. Hiſtoire des Oyſeaux, Lib.* 8. *Cap.* 8. (*d*) *Geſner Hiſt. Anim. Lib.* 3. (*e*) *Aldrov. Ornithol. Tom.* III. *Lib.* 20. *Cap.* 4. (*f*) *Hiſt. des Iſles*, &c. *p.* 300. (*g*) *Hiſt. de l' Acad. Royale*, *p.* 213. (*h*) *Ornithologiæ*, *Lib.* III. *Sect.* 2. *Cap.* 1.

common there, and flying from thence into other Countries. (k) Dr. *Grew* believes it named in Greek from the Scarlet Colour of its Wings; and *Flamment* in French for the ſame Reaſon. *Du Hamel* explains its Name *Becharu* by *Aratri roſtrum, (quaſi Bec-Charüe) quoniam roſtrum ejus aratri inſtar inflectitur.*

Genus. All Authors, from *Ariſtophanes* down to *Aldrovandus*, have accounted the *Phœnicopterus* a Bird of the *Palmipede* or web-footed kind; and tho' this laſt named Author will not allow it to be ſo, yet he is forced to own that it is not a true *Fiſſipede* or digitated Fowl; *nam & membranæ digitos ſepientis quoddam habet rudimentum*, are his own Words. Dr. *Charlton* only, among all the later Natural Hiſtorians, has approved of his Diviſion, and accordingly ranked the *Phœnicopter* in the Claſs of *Aquatick Fiſſipeds*. But that it is a Water-Fowl all agree; *Ariſtophanes* calls it λιμναῖος, i. e. *paluſtris*; and *Aldrovandus* ſays of it, *Avis eſt aquas amans*: not to mention others.

Differentiæ. I find Authors are ſilent as to the different Sorts of this Bird, only *Aldrovandus* gives us two Figures thereof that are not alike.

Locus Natalis. This Bird is found in three of the Principal Parts of the World, that is, in *Africa*, *America* and *Europe*. *Heliodorus* (*Æthiop.* Lib. 6.) calls it Νειλῷον φοινικόπτερον, a Bird of the *Nile*; and the old *Scholiaſt* upon *Juvenal* (Sat xi. ver. 139.) affirms, that *abundans eſt in Africa*; and *Du Hamel*'s Words are, *Inter animantes quæ ſua mole commendantur, Avis illa ex Ægypto allata eſt, quam Veteres ob plumas in alis rubeas* Phœnicopterum *dixere*. *John de Laet* writes, that there is an abundance of them in the Iſland of *Cuba*, as alſo at the Iſle called *Rocca*, lying on the Coaſt of the Province of *Venezuela* in *South America*; and *Rochfort* ſays the ſame thing of the Iſland of St. *Domingo*.

(l) *Dampier* ſaw ſome few of them at *Sal*, one of the Cape *Verde* Iſlands: He hath likewiſe ſeen ſome of them at *Rio la Hacha*; alſo at an Iſland near the Main of *America* right againſt *Querisao*, call'd by the Privateers *Flamingo Key*, from the Multitude of theſe Fowls that breed there; and he never ſaw of their Neſts and Young but there only.

Tho' theſe winged Creatures live for the moſt part in thoſe hot Countries, yet they ſometimes viſit us here in *Europe*, and ſo may be accounted amongſt the Migratory Kind, or Birds of Paſſage, which is confirmed by the Teſtimonies of ſeveral Authors: For,

Bellonius told us long ago, *migrant ultrà mare*, and are often taken in *Italy*, and oftner in *Spain*.

(m) *Gaſſendus* ſays, they are frequently catched in the fenny Grounds and Marſhes about *Arles* in *Provence*, upon the *Rhone*.

Geſnerus. Quidam mihi retulit avem hanc non procul à Monte-Peſſulano

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(k) *Muſæum Reg. Soc. p.* 67. (l) *Damp. New Voyage round the World, p.* 67. (m) *Gaſſ. Vita Peireſc. Lib.* II. *in fine.*

capi. He ſays in another Place, that they ſwim in Flocks not far from the Shore *in Mediterraneo Mari Gallico.*

Willoughby writes, that in hard Weather in the Winter Time, it comes over to the Coaſt of *Provence* (and is often taken about *Martiquez*, a Sea-Port Town in that Country) and in *Languedoc*, and is frequently found about *Montpelier*: But whence it comes and where it is bred, to me, ſays he, is unknown. *N. B.* This Paſſage is not in the Latin Edition of his Works, but added to the Engliſh which was publiſhed two Years after the firſt. However, he ſays poſitively, that they don't come from *Flanders*, where they are ſo far from being common, as ſome alledge, that there never was one ſeen in that Country.

(*n*) Dr. *Charleton* informs his Reader that he was preſented with the Skin of one of theſe Birds, well ſtuffed and dried, by a Gentleman at his Return from the Univerſity of *Montpelier*, near which Place it had been taken. *Hujus exuvias ritè conditas infertaſque mihi dono dedit prænobilis Juvenis D.* Thomas Crew, *Eq. Aurat.*

(*o*) Dr. *Liſter* ſays, *Frequens eſt Phœnicopterus in paludibus maritimis ad mare Mediterraneum Provinciæ & Languedociæ.*

Whether this Bird were known by *Ariſtotle* is a Queſtion; for all our Writers of Natural Hiſtory agree, that the *Phœnicopterus* is no where mentioned by Name by the Philoſopher; yet they can hardly believe that he was ignorant of a Bird ſo clearly deſcribed by his Contemporary *Ariſtophanes. Mirum eſt*, ſays *Geſner*, *hujus tam pulchræ & eximiæ Avis nomen ab* Ariſtotele *taceri, cum* Ariſtophanes, *qui vixit eadem ætate, meminerit. Sed Græcis etiam raram eſſe hanc avem puto.*

Bellonius thinks that *Ariſtotle* deſcribed this Bird under the Name of *Glottis* or *Lingulaca*, as *Theodorus Gaza* tranſlates it. *Aldrovandus* is of the ſame Opinion, but *Geſner* and *Scaliger* are not; for the firſt ſays, *Ego verò iis, quas Gallinulas aquaticas noſtri vocant, avibus Glottidem adnumero quæ omnes fiſſipedes ſunt.* And the latter in his Commentary upon this Paſſage ſays, *Glottis autem quæ ſit nondum mihi conſtat. Ridiculum quod quidam de* Phœnicoptero *auſus eſt pronuntiare.*

Victus Ratio, Nidificatio, Volatus, &c. *Geſner* ſays, *Circa lacus & paludes victitat*, and that it feeds on Perwinkles and Fiſh: And by *Dampier*'s Account we learn, that they delight to keep together in Flocks, and feed in Mud and Ponds, or in ſuch Places where there is much Water; that they are very ſhy, and therefore it is hard to ſhoot them; that they build their Neſts in ſhallow Ponds, where there is much Mud, which they ſcrape together, making little Hillocks, like ſmall Iſlands, appearing out of the Water, a Foot and an half from the Bottom: They make the Foundation of theſe Hillocks broad, bring-

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(*n*) *Charlton de Differentiis & Nom. Animalium.* (*o*) *Liſteri Annot. in Apicium Cœlium, Lib.* VI. *cap.* 7.

ing them up tapering to the Top, where they leave a ſmall hollow Pit to lay their Eggs in. And when they either lay their Eggs or hatch them, they ſtand all the while, not on the Hillock, but over it, with their Legs on the Ground in the Water, reſting themſelves againſt the Hillock, and covering the hollow Neſt upon it with their Wings: For their Legs are very long, and building thus, as they do, upon the Ground, they could neither draw their Legs conveniently into their Neſts, nor ſit down upon them otherwiſe than by reſting their whole Bodies there, to the Prejudice of their Eggs or Young, were it not for this admirable Contrivance, which they have by Inſtinct. They never lay more than three Eggs, and ſeldom fewer. The young ones cannot fly till they are almoſt full grown; but will run prodigiouſly faſt. Thus far *Dampier*.

Du Tertre, in his Hiſtory of Iſles, *&c.* gives theſe further Circumſtances. ‘ Ces oyſeaux, dit il, ont le ton de la voix ſi fort, qu'il n'y à perſonne, en les entendant, qui ne creuſt que ce ſont des trompettes qui ſonnent. Ils ſont toujours en bandes, & pendant qu'ils ont la teſte cachée, barbotant dans l' eau comme les Cygnes, pour trouver leur mangeaille, il y a toujours un en ſentinelle tout de bout, le col étendù, l' oeil circonſpect, & la teſte inquiete. Si toſt qu'il apperçoit quelqu'un, il ſonne la trompette, donne l'alarme au quartier, prend le vol tout le premier, & tous les autres le ſuivent. Ils volent en ordre comme les Grües; que ſi l'on les peut ſurprendre, ils ſont ſi facile à tuer, que les moindres bleſſures les font demeurer ſur la place. Ils ſont rares & ne ſe voyent jamais, ſi non dans les ſalines le plus éloignées du Peuple.

‘ On les écorche, & de leur peaux on fait de fourreurs, que l'on dit etre tres utile a ceux qui ſont travaillez des froideurs & debilité d' eſtomac.

Rochfort likewiſe informs us, That ‘ Ils ont l' Ouye & l' Odorat ſi ſubtile, qu'ils eventent de loin les chaſſeurs, & les armes à feu. Pour eviter auſſi tout ſurpriſe, ils ſe poſent volontiers en des lieux découverts, & au milieu de marécages, d'ou ils peuvent appercevoir de loin leurs ennemis; & il y en a toujours un de la bande qui fait le guet. Ils ſont gras & ont la chaire aſſez delicate. On conſerve leur peau qui eſt couvert d'un mol duvet, pour étre employé aux meſmes uſages que celles du Cygne & du Vautour.

De Laet obſerves, that theſe Birds are ſo accuſtomed to Salt Water, that the *Indians*, when they tame them, mix Salt with the freſh Water for them; elſe they pine away and die. And though *Ariſtophanes* ſays it is ȣ τῶν ἠϑάδων, or not uſed to be tame; yet *Gaſſendus* writes, that *M. Varius*, Preſident of the Parliament at *Aix* in *Provence*, and a great Friend of *M. Peireſc*, uſed to divert himſelf with feeding them with Bread moiſten'd with Water, which they commonly eat in the Night and not in the Day Time. The ſame learned Perſon obſerved, that they could diſcern the Approach of cold Weather, and would come to the Fire, ſo as ſometimes to burn their Feet; and that when one Foot pained them, they would go upon the other, uſing their Bill inſtead of the burnt Foot; That they ſlept ſtanding upright on one Foot with the other drawn up to their Breaſt among their Feathers: And laſtly, that very little Sleep ſerved their Turn.

Uſus. This beautiful and ſcarce Bird was much eſteemed by the *Romans*, and frequently made uſe of in their coſtly Sacrifices and ſumptuous Entertainments. Thus *Suetonius* (q) deſcribing the exquiſite Sacrifices which were appointed by the mad Emperor *Caligula* to be offered to himſelf as a Divinity, ſays of them, 'Hoſtiæ erant Phœnicopteri, Pavones, Tetraones, Numidicæ, Meliagrides, Phaſianæ, quæ generatim per ſingulos dies immolarentur. And the ſame Hiſtorian relates further (r) that this Emperor, 'Pridiè quam periret, ſacrificans reſperſus eſt Phœnicopteri ſanguine.

That the Tongue of this Volatile was much commended, and in great Eſteem for its excellent Taſte and moſt delicious Reliſh, will appear from the following Quotations. And firſt we read in *Pliny* (s) that *Apicius* ſaid the Tongue of this Bird was a delicious and ſavory Bit, 'Phœnicopteri linguam præcipui eſſe ſaporis Apicius docuit, nepotum omnium altiſſimus gurges.

The Poet *Martial* ſays the ſame thing in the forecited Epigram:

Dat mihi penna rubens nomen: ſed lingua guloſis
Noſtra ſapit;

And *Juvenal* (t) in that Satyr where he expoſes the extravagant Luxury and Gluttony of the *Romans*, mentions this Fowl among ſome others equally rare, that they made uſe of in their Feaſts.

Et Scythicæ volucres & Phœnicopterus ingens.

We read in *Suetonius* how the Emperor *Vitellius* had them often ſerved at his Table, with a great many more Varieties brought from the moſt diſtant Parts of the Univerſe; his Words are (u) 'In hâc Scarorum jecinora, Phaſianorum cerebella, linguas Phœnicopterûm, Murænarum lactes à Carpathio uſque fretoque Hiſpaniæ per Navarchos ac Triremes petitarum commiſcuit; hoc eſt, ab extremis imperii finibus Orientem verſus & Occidentem. And *Heliogabalus*, another of the *Roman* Emperors, as *Lampridius* writes, treated his Courtiers with ſumptuous nice Diſhes made of the Inwards and Brains of *Phœnicopters*, *exhibuit Palatinis ingentes dapes extis & cerebellis Phœnicopterorum refertas.*

What is related by *Gaſſendus*, in the Life of that Learned Nobleman, *Peireskius*, is no Argument againſt the excellent Reliſh of the Tongue of this Bird. For his Friend *Varius*, who therein ſeems to contradict the received Opinion, was at that time juſt upon the Recovery from a long Illneſs; he had no Appetite, loathed all Sorts of Meats, and mended but very ſlowly; ſo that its no Wonder if he did not perceive all the Reliſh of that nice Bit, for which of old it was ſo much commended. Beſides this Anſwer is not as to the Tongue, which was owned to be much ſweeter than that of a Kid, but to the Fleſh of this Bird (as will appear from the Original.) ‘Rogatus ſubinde fuit de ſapore carnis Phœnicopteri. Excepit autem mirari ſe, cur illam Apicius apud Plinium, & Imperatores Caligula & Vitellius apud Suetonium, Heliogabalus apud Lampridium & nonnulli alii tantis in deliciis habuiſſent. Eſſe enim eam injucundam, aut ſaporis certe non exquiſiti, aquaticarum aliarum inſtar, cum etiam piſcem oleat; unde à Provincialibus ut plurimum abjicitur, exuviæque ſolum ſunt uſui in faſtuoſis conviviis, carnibus aliarum avium obtegendis.

(q) *Suetonii Caligula*, §. 22. (r) *Scalig.* §. 57. (s) *Plinii Nat. Hiſt. Lib.* X *cap.* 48. (t) *Juvenal. Sat.* XI. (u) *Suetonii Vitell.* §. 13.

The Way to dreſs the *Phœnicopter*, and how to make a Sawce fit for it, we may read in *Apicius*'s Book *de Obſoniis & Condimentis, ſeu de Arte coquinariâ*, Lib. VI. c. 7.

‘Phœnicopterum elixas, lavas, ornas; includis in cacabum, adjicies aquam, ſalem & aceti modicum; dimidiâ cocturâ alligas faſciculum porri & coriandri ut coquatur: Prope cocturam defrutum mittis, coloras: adjicies in mortarium piper, cuminum, coriandrum, laſeris radicem, mentham, rutam: fricabis: ſuffundis acetum: adjicies caryotam. Jus de ſuo ſibi perfundis, reexinanies in eundem cacabum, amilo obligas, Jus perfundis & inferes. *Aliter.* Aſſas avem, teres piper, liguſticum, apii ſemen, ſeſamum, defrutum, petroſelinum, mentham, cepam ſiccam, cariotam; melle, vino, liquamine, aceto, oleo & defruto temperabis.

Philoſtratus. ‘Puniceam avem, *i. e.* Phœnicopterum, inter menſarum delicias numerat, *Lib.* VIII. *Vitæ Apoll.*

Muſæum. *Wormius.* ‘Linguam hujus avis veteribus Romanis in deliciis olim fuiſſe docent cupediarum magiſtri Apicius & alii.

Dr. *Grew.* The Tongue of this Bird, as *Apicius* ſaid, was a delicious Morſel among the *Romans.*

N. B. In the Treatiſe *de Obſoniis & Condimentis*, that goes under the Name of *Apicius*, there's no mention made of the Tongue of this Fowl: For as Dr. *Liſter* well obſerves, ‘Apicius noſter hîc ſilet de linguæ præcipuo ſapore: Which is a pretty convincing Proof, that this Book *de re coquinaria*, is only a Collection made by ſome modern *Roman*; the Name of the old *Apicius*, that great Maſter of the Art of Eating, being only prefixed to it, for the Benefit of the Bookſeller.

Dampier. The Fleſh of both young and old is lean and black, yet very good Meat, taſting neither fiſhy nor unſavory: A Diſh of *Flamingo*'s Tongues being fit for a Prince's Table. They are large, having a large Knob of Fat at the Root, which is an excellent Bit.

Du Tertre. ‘ La chair en eſt excellente, quoy qu'elle ſent un peu la ‘ marine: mais ſur tout la langue paſſe pour le plus friand morceau ‘ qui puiſſe etre mangé.

Deſcriptio Partium.

Magnitudo. According to *Bellonius* this Bird is of the Bigneſs of the Fowl he calls *Elorius*, which is our *Curliew*.

Scaliger compares it to the Heron, *magnitudo ei Ardeæ*.

Geſner ſays it is as big as a *Ciconia* or Stork, or rather bigger.

Aldrovandus writes, ‘ de magnitudine ejus ego nihil certi aſſero, ‘ quia avem nunquam vidi.

Dampier. The *Flamingo* is a ſort of large Fowl much like the Heron in Shape, but bigger and of a reddiſh Colour.

Du Tertre. ‘ Le Flamand eſt un oiſeau gros comme une Oye ſauvage.

Collum. It hath an extraordinary long Neck according to Mr. *Willoughby*.

Du Tertre. ‘ Il a le cou rouge, fort menu pour la grandeur de l' ‘ oyſeau, & long d'une demy Toiſe.

Cauda. Scaliger. ‘ Caudam habet breviſſimam ac veluti præciſam.

Roſtrum & Caput. Scaliger writes, that the Bill of this Fowl is neither ſtreight nor altogether crooked: ‘ Roſtrum neque rectum planè ‘ ſed neque aduncum habet, Scythici arcus partem potiùs imitatur.

Geſner, who compares this Bird to the Crane for Bigneſs, adds, ‘ Roſtro ſeſquialtera fere longitudine ad Ciconiæ roſtrum, ſuperius ‘ craſſo & tuberculis quibuſdam aſpero.

Aldrovandus commends the Account *Scaliger* gives of the Bill, and then adds, ‘ In Roſtri autem conformatione non parum luſit Natura; ‘ non enim, ut Anatûm aut Anſerûm, planum eſt, cum alioqui ſit latum, ‘ neque ut Ardearum rectum & rotundum, neque denique ut rapacium Aquilarum aut Accipitrum aduncum; cum tamen ſit curvum ‘ quidem & deorſum inflexum, ſed in medio ſuperioris mandibulæ notabili extuberantia inſigne, ſex digitos longum, intus cavum & canaliculatum media ſui parte. Superior etiam mandibula inferiori longior eſt, & in acutiſſimam aciem deſinit; contra vero inferior longè ‘ craſſior.

Du Tertre. ‘ Il a la teſte ronde & petite, à laquelle eſt attaché un ‘ gros bec, long de quatre pouces, moitiè rouge & moitiè noire, & ‘ recourbé en forme de cüeilliere.

Olaus Wormius gives the following Deſcription of the Head and Bill of the *Phœnicopter*, which he had ſent him from a Friend, *viz.*

‘ Caput longitudine uncias octo ſuperabat, ipſum caput, excepto ‘ roſtro, trium erat. Roſtrum ipſum figuram à *Scaligero* delineatam ‘ obtinet in medio craſſum ſatis ſed cavum, ſuperiore ejus parte utrinque ad latera caniculatum; ad ſui exortum duobus grandibus foraminibus olfactui deputatis præditum, in extremitate aduncum, internè denticulatum cum coſtâ ſeu eminentiâ in medio. Pars vero inferior

'rior nigra, frequentibus prædita ſtriis ad extremum excurrentibus; 'longitudine vero cedit ſuperiori, ſed ampla eſt & capax, craſſæ lin'guæ quæ aberat, excipiendæ apta.

Dr. *Grew* has obliged us with a very curious Account of the Bill of this Bird, for which he ſays it is moſt remarkable. The Figure of each Beak is truly Hyperbolical: The upper Jaw is ridged behind, before plain or flat, and pointed like a Sword, with the Extremity bended a little downwards: Within it hath an Angle or ſharp Ridge, which runs all along the Middle, at the Top of the Hyperbole, not above a quarter of an Inch high: The lower Beak in the ſame Place above one Inch high, hollow, and the Margins ſtrangely expanded inward, for the breadth of above a quarter of an Inch, and ſomewhat convexly. They are both furniſhed with black Teeth, as I call them from their Uſe, of an unuſual Figure, *ſcil.* ſlender, numerous, and parallel as in Ivory Combs; but alſo very ſhort, ſcarce the eighth Part of an Inch deep. An admirable Invention of Nature, by the Help of which and of the ſharp Ridge abovementioned, this Bird holds his ſlippery Prey the faſter.

Mr. *Ray* deſcribes the *Roſtrum* to be *latiuſculum, ſingularis & inſolitæ figuræ; mandibula nempe ſuperior incurva, depreſſa, dentata; inferior craſſior.*

Menippus, the Cynick Philoſopher, in a Fragment of his *de Homine* (which however at this Time is either loſt, or at leaſt hard to be come at) affirms this Bird to move its upper Jaw, as we find him quoted by (y) *Rondeletius*, where he is talking of the Crocodile's moving that Mandible: His Words are, *Sed id non ſoli ex omnibus animalibus Crocodilo peculiare, nam inter aves,* Phœnicopterus *ſuperiorem partem Roſtri movet, ut annotavit* Menippus *Philoſophus, Libro de Homine.*

Geſner makes the very ſame Quotation from *Rondeletius*.

(z) *Cardanus* repeats the ſame thing without mention of any Author, *Nam quidam exiſtimant etiam Phœnicopteros aves Mandibulam movere ſuperiorem*; but ſubjoins, *ſed non adeo manifeſta cauſa eſt in Ave ut in Crocodilo.*

Wormius is of the ſame Opinion; but with *Cardan*, he thinks the Cauſe is not ſo manifeſt as in the Crocodile.

Dr. *Charlton* ſays, that it was *Cardanus* that firſt made that Obſervation.

Dr. *Grew* argues for this Movement from the peculiar Structure of the *Roſtrum*; alledging, however, that there can be no Determination of theſe Matters, without Inſpection into the Muſcles, and the Articulation of the Bones. As for the *Phœnicopter*, ſays he, it muſt needs be ſaid, that the Shape and Bigneſs of the upper Beak (which here, contrary to what it is in all other Birds that I have ſeen, is thinner and far leſs than the neither) ſpeaks it to be the more fit for Motion, or to make the Appulſe, and the neither to receive it.

(y) *Rondel. Lib. de Amphibiis, Chap.* 5.
(z) *Cardan. de Varietate Rerum, Lib.* 7. *Cap.* 37.

Crura & Pedes. Bellonius remarks, that the Legs of this Volatile are very long. And on the contrary,

* *Scaliger* writes, *Crura pedeſque ſunt adeo breves, ut cùm in Homine* Galenus *agnoverit longiſſimos, huic omnium, quæ nota ſunt nobis, animalium breviſſimos attribuere potuerit.* For this he is ſeverely taxed by Dr. *Charlton, hic nobis candidè notandus occurrit error quidam* Scaligeri *egregius: Is nimirùm in Exercit.* in Ariſt. *Hiſt. Animal.* (this is wrong quoted, the Place being in *Ariſt. Lib. de Generat. Anim.*) *peculiares* Phœnicopteri *notas ſatis prolixè deſcribens, crura ei breviſſima curtoſque pedes attribuit, (verbis ſupra citatis) atque Avem hanc & cruribus & ſuris gradiri longiſſimis, omnium quotquot ſeu vivam ſeu mortuam contemplati ſunt oculi confirmant. Et quis precor, ullam aliam, ex Aquaticarum fiſſipedum & piſcivorarum claſſe, volucrem unquam conſpexit brevibus pedibus inſtructam? Certè nemo. Neque conſentaneum eſt, ut quas Naturæ conſilium ad piſces in ſtagnis & fluviorum vadis, non natando ſed grallatoriis veluti gradibus vadando, captandos deſtinaverit, eis crura concederentur tam neceſſario ad victum quærendum officio imparia. Ad hæc, non aliunde fuit quàm à proceritate crurum & colli, quod* Phœnicopterus *olim à* Juvenale ingens *diceretur.*

Dr. *Grew* obſerves the ſame Miſtake, but in fewer Words, which are the following; *when* Scaliger *therefore ſaith that this Bird hath the ſhorteſt Legs of any Animal yet known, he would have ſaid the longeſt.*

Geſner ſays, it is *Cruribus rubris, ea proceritate qua in Ciconia ſunt, vel procerioribus.*

‘ Du Tertre. C'eſt le plus haut monté de tous les oyſeaux que j'ay
‘ jamais veu en ma vie. Il a les jambs tout rouges, & les pieds a de-
‘ mi marin.

‘ (y) Rochfort. Ils ont les jambs & les cuiſſes ſi hautes, que le reſte
‘ de leur corps eſt elevé de terre de deux bons pieds ou environ.

Color plumarum. Scaliger thus elegantly expreſſes the fine Colour of its Wings. *Cinereum colorem nobilitant alarum puniceæ pennæ.*

Aldrovandus. *Mirum eſt cur nigrum alarum colorem non annotavit* Scaliger. *Cætera tota Avis ex cinereo, phœniceo & albo coloribus miſtis ſpectatur.*

Geſner ſays, *Pennis albis parte prona; rubentibus per Collum, Pectus, Ventrem & Alas;* and ſpeaking of one taken near *Montpellier,* he ſays, *tota alba, præter illas in alis partes quæ nigræ ſunt in Ciconiis.*

(z) *De Laet* obſerves, that while they are young their Feathers are chiefly white; but as they grow up, they are painted with an Infinity of Colours. ‘ Mais ils different en couleur, d' autant qu'ils ont
‘ le plumage blanc quand ils ſont jeunes; puis apres à meſure qu'ils

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* Scalig. *Exercit.* 233. § 2. *de Subtilitate, ad* Cardanum. (y) *Hiſt. des Antilles, Edit. Roterd.* p. 583. (z) *Hiſt. du Nouveau Monde, Lib.* 1. *Cap.* 9. *& Lib.* 18. *Cap.* 15.

‘ croiſſent, ils devient de couleur de roſe, & en fin quand ils ſont
‘ agez, il eſt tout incarnat. Il ſe trouve de ce mémes oiſeaux, prés
‘ de *Montpelier*, qui ont ſeulement le deſſous des ailes & du corps incar-
‘ nat, & le deſſus noir. Il s'en voit auſſi aux Iſles, qui ont les ailes
‘ mélees de quelques plumes blanches & noires.

Du Tertre gives much the ſame account. ‘ Les Jeunes ſont beaucoup
‘ plus blancs que les vieux, & ils rougiſſent à meſure qu'ils avancent
‘ en age. J'en ay veu auſſi quelques uns qui avoient les ailes meſlees
‘ de plumes rouges, noires & blanches, & je croy que ce ſont les
‘ mâles.

(†) Conſtantinus. *Roſtrum, & crura, & pars alarum, punicio colore rutilat.*

Willoughby ſays, the Neck and Body is white: The *Alarum Remiges*, or Quill-Feathers of the Wings, are black; but the *Veſtitrices* or Covert-Feathers are wholly dyed with a moſt beautiful, bright purple, or flame-Colour, *unde ei nomen.*

Dampier. The young ones at firſt are of a light grey; and as their Wing-Feathers ſpring out, they grow darker, and never come to their right Colour, or any beautiful Shape, under ten or eleven Months old. When many of them are ſtanding together by a Pond's Side, being half a Mile diſtant from a Man, they appear to him like a Brick Wall; their Feathers being of the Colour of a new red Brick: And they commonly ſtand upright and ſingle, one by one exactly in a Row, except when feeding, and cloſe by each other.

Color Pedum. All Authors agree in the red Colour of its Legs and Feet. Thus *Scaliger*, *Crura pedeſque alis habet concolores.*

Color Roſtri. Geſner ſays, *Colore rubro inſtar ſanguinis.*

Aldrovandus writes, *Pars quæ ſpectat frontem ex albo ad Caſtaneæ colorem vergit, cæterò nigrum.*

Willoughby affirms, that the Tip of the Bill is black, or of a dark blue.

Figuræ. The whole Fowl is delineated by *Geſner* and *Aldrovandus*: and Dr. *Grew* has given us the Figure of the Head and Bill, as he found it amongſt the Rarities in *Greſham-Colledge*. *N. B.* The Figure of the *Phœnicopter* in *Willoughby* is copyed from the ſecond of *Aldrovandus*. *Geſner* ſays the *Phœnicopterus* whence his Figure was taken, was ſent to him by *Rondeletius*. *Aldrovandus* had the firſt of his Figures from *Sardinia*; and the ſecond, which he calls *Phœnicopterus alter roſtro lato*, was given him by that famous Botaniſt *Carolus Cluſius*: He owns that he never ſaw the Bird himſelf.

In *de Rochfort*, the Body and Neck of the *Flammant* is pretty well delineated; but the Legs are not, neither is the Bill, nor the Claws.

(†) *Conſtant. Lexicon Græco-Latin.*

(*) *Du Hamel*

Plate XVI. Part III P 375

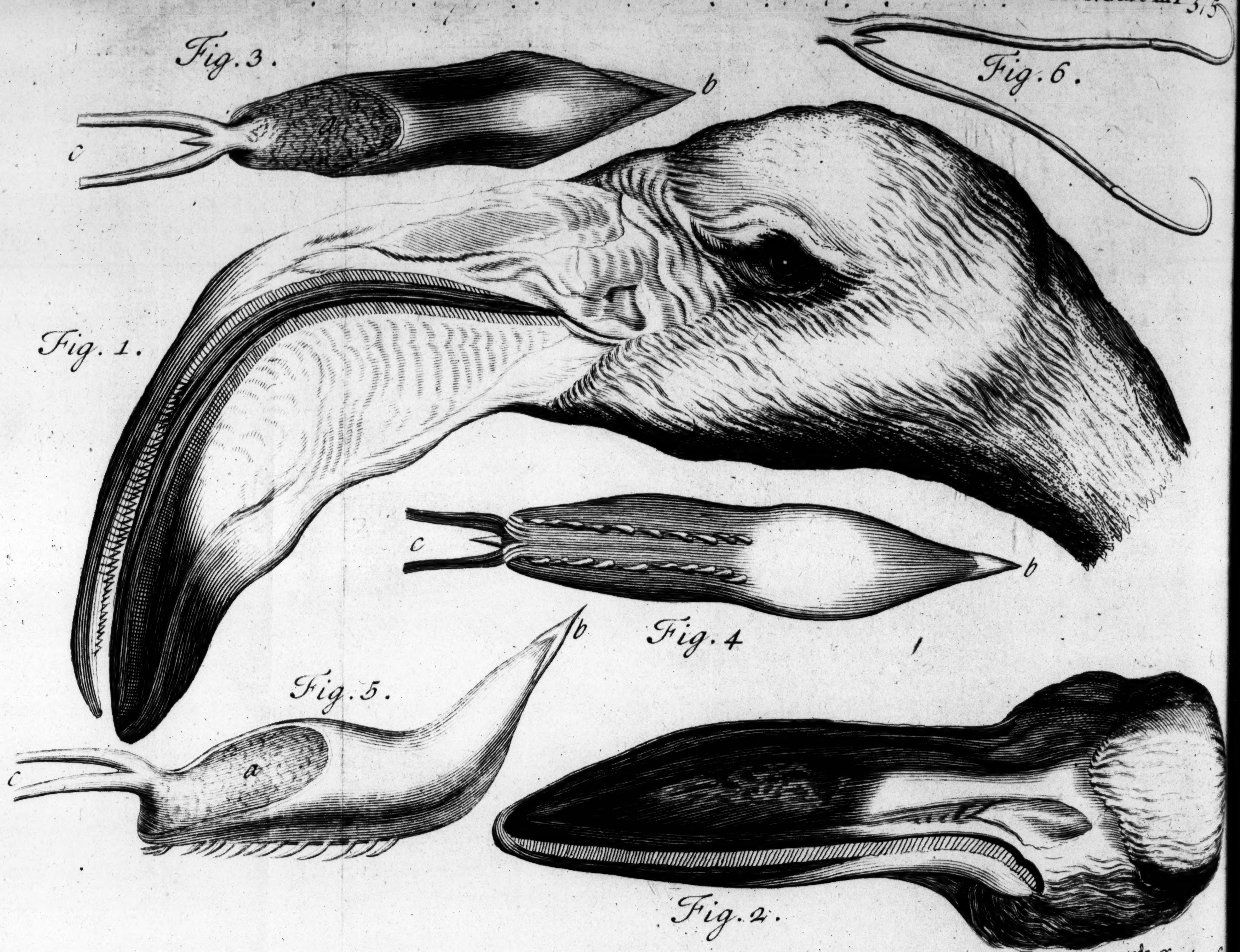
Fig. 3.
a
b
c
Fig. 6.
Fig. 1.
c
b
Fig. 4
b
Fig. 5.
c
a
Fig. 2.

N. Bundock delin.

V^{dr}. Gucht Sc

(*) Hiſt. Acad. Royale Edit. Paris, p. 213.

(*) *Du Hamel* gives a very exact Account of this Bird in the following Words, with which I'll cloſe this tedious and prolix Deſcription, collected from all the Authors that have made any mention of the *Phœnicopter* or *Red-Wing. Collo prælongo, cruribus productis, exili pede ſed firmo donatur; oculi itidem anguſti ſunt & rubei; cyſtis fellea è parte inferiore hepatis eſt penſilis. Vas ipſum è quo ſuſpenditur, quove bilem excipit, amplum eſt, contra atque in Homine & in Quadrupedibus obſervatur; in his enim radices veſiculæ ſunt admodum exiles. Oeſophagus in ſui initio valde anguſtus, paulatim latior factus in ingluviem ſeu in ſaccum ampliorem deſinit: Ventriculus fere ut in* Gallina, *tametſi Granis non veſcitur, ſed parvis Conchyliis, quæ ventriculi muſculis teruntur ut Grana.* This Author tells us that the *Phœnicopter* was diſſected by Monſieur *Perault* at *Paris.*

Alæ ejus diductæ colorem illum rutilum exhibent, unde vulgo Flamand *dici ſolet, non quod in* Belgio *reperiatur, ſed quia ejus Plumæ per membranam pellucidam viſæ colorem flammeum præbent: Vix ulla eſt Avis major: Roſtrum ex utraque parte deorſum incurvatum, quod in ea Ave omnino eſt ſingulare; aratri enim inſtar inflectitur, unde & vulgo* Becharü, *quaſi Aratriroſtrum, appellatur.* Hæc ille.

The Explanation of the Figures. Plate 16.

Fig. I. Gives a Side-view of the Head and Bill.

Fig. II. In this is repreſented a Front-view of the ſame Parts.

Fig. III. Exhibits the under-ſide of the Tongue next the under Bill. In which *a* denotes a Cartilaginous Subſtance that covers the Tip or extremity of the Tongue; *b* a Glandulous Subſtance at its *Baſis*; *c* the Horns of the *Os Hyoides.*

Fig. IV. In this the upper ſide of the Tongue is fairly delineated, upon which we ſee two Rows of ſtrong *Papillæ Nerveæ*; their *Apices* or Points turning inwards, for the better retention of the Prey.

Fig. V. In this the Tongue is drawn in a lateral View, that we may have a Proſpect of the true Figure of theſe *Papillæ*, which being hooked and turn'd backwards prevent, in a great Meaſure, the return of any little Animal ſwallow'd alive, which they feed upon.

Fig. VI. The *Cornua* or Horns of the *Os Hyoidæum* are drawn in this laſt Figure, as all the other Parts are, as big as the Life.

Of Rattle Snakes, by Dr. Mather. *n.* 339. *p.* 67.

XX. The *Rattle-Snake* ſeems to take its Name, from the Rattles in its Tail, in which are ſometimes twenty of thoſe looſe Rings. The more Northerly they travel, theſe Snakes are leſs numerous, as well as leſs Venomous; nor as it is ſaid, are any ſeen to the North of *Merimack* River, which is about 40 miles North of *Boſton.* It is conſtantly affirmed by the *Indians*, that theſe Snakes frequently lie coiled at the Bottom of a great Tree, with their Eyes fixed on ſome Squirrel above in the Tree; which tho' ſeeming by his cries and leaping about, to be in a Fright, yet at laſt runs down the Tree, and into the Jaws of the Devourer. The Winter-aboad of theſe Snakes is in the Clefts of inacceſſible Rocks, from whence in the Spring, they come forth a Sunning themſelves, at firſt very feeble, which is their chief time of deſtroying them. At this time the *Cyſts* or Gall-bladder in theſe Snakes is full of an acid azure Coloured Juice, which they ſqueeze out into a Glaſs, but it is ſo Spirituous, that if the Glaſs be not immediately ſtopt, it will ſoon evaporate; this Liquor thereſore they mix with a convenient quantity of powder'd Chalk or *Indian* Meal, and uſe it as a proper Medicine againſt the venemous Bite of this Snake; ſome have named it *Trochiſci Connecticotiani*, from the Connecticot *Colony*. 'Tis obſervable when the Summer Heats come on, the Snakes have no longer this azure Liquor in their Gall-Bladders, in which there is only found a black thick Sediment, of no known uſe, at which time they think the forementioned ſpirituous Juice is carried to, and lodged in their Gums, and ſo conveyed or thrown by the hollow of the Teeth into the Wound, when they bite, having received another Digeſtion, and higher Exaltation, by paſſing through ſeveral Strainers and Glands before it arrives to the Gums.

As an Inſtance of the Virulence of the Liquor, a Traveller killing one of theſe Snakes ſuffered the inraged dying Viper to bite the end of the Switch, with the Laſhes of which he had diſabled him; and a Fly by chance diſturbing one of his Temples as he rod on afterwards, he rub'd his Temple with the other end of the Switch, which immediately cauſed his whole Head to ſwell to a great Exceſs, the Poiſon as he ſuppoſes permeating the whole length of the Switch. Another provoking a Rattle-Snake to bite the Edge of a broad Axe he had in his Hand; the Colour of the Steeled part bitten, was immediately changed, and at the firſt Stroke he made with it in uſing his Ax, the ſo diſcoloured Part broke out, leaving a Gap in his Ax. But to return to the *Trochies* made of the Gall, it is a Cordial Sudorifick, and ſo good an Anodine, that ſome take three or four Grains of it to compoſe them to Reſt after Travel. 'Tis good in all Fevers, eſpecially the Malignant. 'Tis an infallible Remedy for Obſtructions incident to Women upon catching Cold in Child-bed. Being taken in a convenient Quantity, twelve Hours before the Fit, it certainly cures a Quartan Ague. The Doſe is fourteen Grains more or leſs according to the Circumſtances of the Patient in any Vehicle.

Account of ſome Fiſhes and Birds at North Bierly, *by Dr.* Richardſon, *n.* 337. *p.* 168

XXI. About ſix Years ago, great Quantities of Tench were taken in a Pond belonging to *Stephen Tempeſt* of *Broughton* in *Craven*, Eſq; and were ſent to the neighbouring Markets. The Fiſh were taken on *Monday* towards Night, and ſome brought to *Bradford* on *Tueſday* about the ſame time; and not being frequent in our Markets, ſix of them were ſent hither by Mr. *Ferrand* the Vicar on *Wedneſday*. I not being at home, the Basket was ſet upon the Kitchen Table, not far from a good Fire; where it continued till *Thurſday* Morning (the Servants not knowing what was in it.) Upon opening the Basket, and looking upon the Fiſh, I thought the Eyes of ſome of them look'd clear: I put two of them into a Pail of Water, and in leſs than two Hours time they ſwam very lively in the Water. The remaining 4 having no Signs of Life upon them, I put them into the ſame Pail, and before Night they all ſwam about in it. *Burbolts*, being a Fiſh not frequently met with in the Southern Rivers of *England*, are often found in this County, eſpecially in ſlow Rivers and ſtanding Waters, as in the River *Foſs* in *York*, and alſo in *Derwent*; but in no Place more frequent, than in the Fen Ditches of the Levels, about four Miles from *Doncaſter*. I have been ſeveral times preſent, when plenty of ſmall Trouts have been caught in the mountainous Lakes of *North Wales* by Angling; and have, with no ſmall Admiration, conſider'd the difficult Acceſs to theſe Places, where a good Footman can ſcarce climb up to them. That theſe Lakes are yearly ſupplied from the Brooks at the Bottom of the Mountains I do not at all doubt, eſpecially in Spawning time, when the Trouts endeavour to ſurmount all Difficulties, by paſſing up the ſmall Rivulets, to depoſite their Spawn, for the Preſervation of their Species, where it is the moſt ſecure from the Violence of other Fiſhes, and there by accident fall into theſe Natural Ponds, where they continue all Summer; no Perſon having yet obſerved (that I know of) Trouts to breed in Ponds. Not only the Trouts that are taken in theſe mountainous Lakes are ſmall, but alſo the Charrs that are taken as they aſcend the ſmall River out of the great Lakes nigh *Llhan Berys*, to depoſit their Spawn in the Sands there. Theſe very rarely exceed a freſh Herring in Magnitude, and are in no reſpect different from thoſe taken in *Winander-Mear*, ſave in Magnitude, where 'tis no rare thing to meet with them of two pound Weight and upwards. This Smallneſs in Fiſhes I have ſometimes thought to proceed from the Coldneſs of the Water, theſe Lakes being ſupplied with Snow Water from the Mountains eight Months in twelve. The *minera* of Vitriol and Allum being often met with in the Hills thro' which ſome of the Water muſt drain, perhaps does not a little contribute to the Roughneſs and Coldneſs of the Water. The contrary we find in our Waters that run through the Limeſtone Rocks, where no rough Salts are found; the Trouts there are large and fat. An Inſtance of this we find in the Trouts in *Malham Tarr* in *Craven*, nigh *Setle*, where they are frequently found two Foot long.

I muſt alſo take Leave to correct one Miſtake of Mr. *Ray*, where he ſays * that *Muſtela vulgaris* is called here a *Foumart* or *Fitchet*. *Putorius* is called here a *Foumart*, *quaſi* foul Mart, or ſtinking Mart, in Oppoſition to the Martes which emit a musky Smell, and are often met with in our Woods, and taken by the Hunters in Snow.

The *Ermin* is not unfrequently met with here in Winter, and look'd upon, when they appear, to preſage Snow. I ſhould not here have taken notice of it, it being alſo met with in moſt Counties of *England*, but that I have had the Opportunity in two or three Inſtances, of obſerving the Time of its Changes. It begins to change its Colour from Brown to White about the beginning of *November*. I had one of them brought me about *November* was two Years, when I firſt obſerved this Change. I have one or two of them, that in the beginning of *March* were changing from White to Brown. *Qu.* Whether theſe Animals do not always continue White in the more Northern Parts of the World?

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* *Synopſ. Quadrup. p.* 195.

The *Nut hatch* or *Nut-jobber* is not frequently to be met with in the South, yet is ſo common with us, that I have ſometimes ſeen ſix or ſeven of them in one Day in my own Woods. This muſt be the Bird that Dr. *Plot* in his *Nat. Hiſt.* of *Oxfordſhire*, calls a *Wood-Cracker*, and takes to be an undeſcribed Bird. I have with much Pleaſure often obſerved theſe Birds to crack Nuts, which they do with very great Dexterity. I ordered one of my Servants, that was with me in a Wood laſt *Chriſtmas*, to obſerve from whence ſhe fetched her Proviſion; which he ſoon diſcover'd in a hollow Tree, and cutting the Place open, brought from thence ſeveral Pints of very choice Nuts. I met with a Neſt of the *Regulus Criſtatus*, in a thick Thorn Hedge, in my own Orchard, which was built round, and a little Hole at the ſide; the outſide was green Moſs, the inſide Hair and Feathers, not much unlike that of the common Wren. The Eggs were ſmall and white, with many brown Spots upon them. The Note of the Cock is very agreeable, not much unlike ſome of the *Parus* Kind. I do not remember that I have ſeen any of theſe Birds in the Summer before.

Of the Yellow Gurnard, *by Dr.* Tyſon, *n.*293.*p.*1749.

XXII. If we may juſtly infer an Identity of Species in Fiſhes, from the Likeneſs of their Fins, we have then ſome Ground to conclude that this Fiſh ought to be referred to the *Gurnard* kind. Not but that in many Particulars, and thoſe very remarkable too, it differ'd from it. However, not finding any other Species it agreed with better; and the Fiſhmonger not knowing any Name 'twas call'd by where taken, which was about *Haſtings* in *Suſſex*; I ſhall take the Liberty to call it the *Yellow Gurnard*: and that I had ſome Colour of reaſon for doing this will appear, when I have compared this Fiſh with the *Red Gurnard*, and ſhew'd wherein they agreed or differ'd. And firſt as to the general Shape of their Bodies I found an Agreement enough. In both, the Head was the biggeſt part; the Body thence gradually ſtill leſſening and growing taperer, as it approached the Tail, where it was very ſmall in both. The *Yellow Gurnard* meaſured eleven Inches in length, whereof the Tail was two. The Girth of the Head was four Inches and a half.

The Fins, as to Number and Situation, or placing on the Body, were exactly the ſame in both; I ſhall therefore omit their Deſcription, and only take Notice wherein they differ'd in other Circumſtances. As in the fore Fin on the Back of the *Yellow Gurnard*, there were four or five *Radii* or Spines; whereof the firſt was ſix Inches long; the next about two; the others ſhorter: In the *Red Gurnard* in this Fin were ſix ſtrong bony Spines, ſharp pointed; whereof the ſecond from the Head being the longeſt, was only a little above an Inch, and the reſt not much ſhorter. Note the *Red Gurnard* I had to compare with, was but ſmall, and ſomething leſs than the *Yellow* one. In the hinder Fin of the Back of the *Yellow Gurnard* there were nine *Radii*; in the *Red Gurnard* fourteen; in both, the *Radii* near the Tail were the longeſt; thoſe in the *Yellow Gurnard* being two Inches and half long. The Membrane that joyned theſe *Radii* of the Back Fins, as to Colour differ'd very much in theſe Fiſhes. For in both the Back Fins of the *Red Gurnard* this Membrane was all of a White tranſparent Colour. In the fore Fin of the *Yellow Gurnard*, the Membrane was yellowiſh with blue Spots, and ſome edged with black, and the Membrane of the hinder Fin was of a faint bluiſh Colour, with four yellow Liſts or Streaks about a Line broad, running the whole length, as in the Figure.

The *Pinnæ Bronchiales* (whereof there were two of each ſide, and their Situation in both the ſame, the uppermoſt being inſerted Perpendicular, the lowermoſt Horizontal to the Body) differ'd in Colour. For in the *Yellow Gurnard* the uppermoſt Fins were white, the lowermoſt of a dark blackiſh Colour, with ſeveral beautiful long Spots of an azure Blue. In the *Red Gurnard*, the uppermoſt Fins were of a dark reddiſh Colour; the lowermoſt white: But between theſe two Fins I obſerved 3 naked *Cartilaginous Radii*, which are not in the *Yellow Gurnard*, and are well expreſſed in *Salvianus*'s Figure of the *Red Gurnard*. The Fin on the Belly was plac'd exactly alike in both. The *Yellow Gurnard* here had nine *Radii*, and its Membrane of a darkiſh blue Colour. The *Red Gurnard* had ſeventeen or eighteen *Radii* here, and its Membrane tranſparent white. The Tail in both was much the ſame. Over the *Anus* in the *Yellow Gurnard* was a ſlender pendulous Body, which was not obſerved in the *Red Gurnard*. The Colour of the Body of theſe two Fiſhes differ'd likewiſe very much; and I know not, but that it may be a Property in this Species to vary in Colours, more than other Fiſhes do. The Belly of the *Red Gurnard* was of a Silver Colour, and ſome Part of the Sides near the Belly: the reſt, and the Back and the Head, were of a reddiſh Colour. In the Head there were ſome ſmall whitiſh Spots The Belly of the *Yellow Gurnard* was white, but under the lower Jaw was black. The Sides and Back were yellowiſh; but between the Sides there ran a blue Streak or Liſt about a Line and a half broad from the Head to the Tail; and a little higher on the Sides there was a Chain of blue Spots the length of the Fiſh; for on the Sides of the Head I obſerved theſe blue Spots, only from the Eyes to the end of the *Roſtrum* the Spots were of a deep yellow Colour. There being therefore ſo much blue and yellow over the greateſt Part of the Body of this Fiſh, I have given it the Epithet of *Cæruleo-flaveſcens*; for, where the Ground is blue the Spots are yellow, and where yellow the Spots are blue.

Though hitherto there ſeems a tolerable Agreement between theſe two Fiſhes, yet in the Remarks I ſhall now add, the Diſagreement will appear greater. For the *Yellow Gurnard* was without Scales, I therefore call it *Lævis.* The *Red Gurnard* had not only Scales on the Back, but likewiſe a Ridge of ſpiny Scales all along the Sides; as alſo of each ſide the Back Fins were placed the like ſpiny Ridges or Scales. But the Belly ſeemed almoſt ſmooth, and had but few Scales, and thoſe very fine; and indeed thoſe on the Back were much ſmaller than thoſe in moſt other Fiſhes. If Mr. *Leewenhoeck*'s Obſervation be true, that even the *Anguillous* Kind are Scaly, then the Difference will not be ſo great, the one having *Membranulous* Scales, the other bony. Or it may be our Subject is an intermediate Species between the *Gurnard* Kind and ſome other. And this I am the more apt to believe, becauſe, though it has Gills of each ſide, yet it had not thoſe Apertures at the ſides of the Head that the *Red Gurnard* had, and is common to moſt Fiſhes but the *Cetaceous* Kind; but, like them, the *Yellow Gurnard* had two Apertures, or large *Foramina* placed on the hinder part of the Head, an Inch beyond the Eyes, at which it ſpouts out the Water. By blowing into theſe Holes I extended the Cavities where the Gills lay; and obſerved that over theſe Cavities was placed a flat Bone, which by the Contraction of its Muſcles might ſerve to force the Water out, and perhaps is aſſiſted in this Action by another looſe Bone that lies over it, whoſe Edges are jagged or indented, as in the Figure: At which *Plate* 17. *Fig.* 1. Place in the *Gurnard* I obſerved a ſtrong ſharp Spine.

Theſe *Foramina* in the Head of this Fiſh is a thing ſo very remarkable, that it may be look'd upon as a Characteriſtick; nor do I know at preſent what other Fiſh to parallel it with: For the *Cetaceous* Kind that have Spouts in their Heads, have not *Bronchiæ*, but Lungs. The better therefore to diſtinguiſh this Fiſh, I have added this Particular to its Name: And could wiſh, that inſtead of thoſe ſilly Names that are given to moſt Fiſhes, others were found out, that might be more expreſſive; and that their Claſſes were ſo order'd by ſuch ſpecifick Differences, that one might better know where to range them, as in a good Perfection is now done in the Vegetable Kingdom, which is more numerous. I obſerved the Eyes in the *Yellow Gurnard* were placed more on the Top of the Head, and the Skin here covered almoſt half of them, like an Eye lid; which I did not obſerve in the *Red Gurnard*, whoſe Eyes were placed more at the ſides of the Head. The Head likewiſe of the *Red Gurnard* was more protuberant, in the *Yellow* flatter. The End of the *Roſtrum*, the Teeth and Tongue in both were exactly alike; only in the Palat of the *Yellow Gurnard* I obſerved two Cartilaginous Bones, whoſe Edges were bended downwards from the Palat, and did ſerve, as I ſuppoſed, for the hooking in and ſtaying the Cartilage of the Tongue, when it makes a Compreſſion for the forcing out the Water by the *Foramina* of the Head. Which Contrivance I did not find in the *Red Gurnard*, not having the like Occaſion for them. This Fiſh being ſtale, I had not an Opportu-

nity

Plate 17. Part III P. 380.

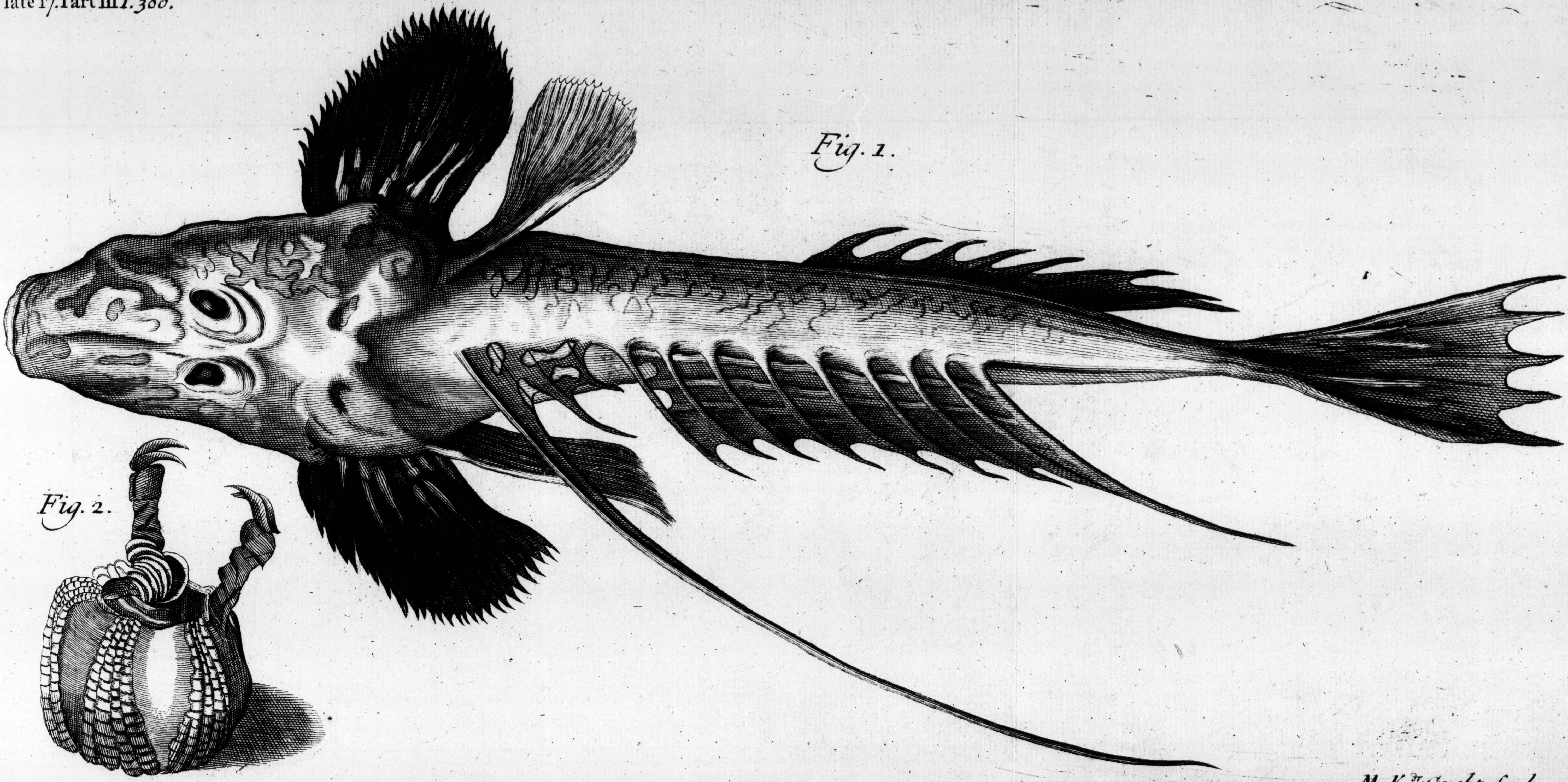


Fig. 1.

Fig. 2.

M: V^dr Gucht Sculp:

nity of diſſecting it, and obſerving the *Viſcera*: And ſhall only farther add, That the Gills had four Oſſeous *Radii* of each ſide.

Fig. 2. Pl. 17. A Shell-Fiſh, by Sir Robert Sibbald. *n.* 308. *p.* 2314.

XXIII. The curious Shell Fiſh was ſent by Mr. *Foſter*, a Regent in the College of *St. Andrews*, to our College of *Edenburgh*; ſeveral of them, he ſays, were taken upon the ſides of a Whale that was caſt in there. Such another was caſt in in *Edinborough-Frith* ſome thirty Years ago. It the *Balanus Balænæ cuidam Oceani Septentrionalis adhærens D. Mart. Liſteri, Hiſt. Conchil.* The *Pediculus Cæti* of *Bocconi*, who for ought I know, was the firſt that mention'd it, in his *Recherches & Obſervations Naturelles.* His Deſcription of the Shell is better than the Figure he giveth of it. I preſume to give you my Remarks upon it.

The Shell approacheth to a Sexangular Figure, and conſiſteth of one Valve, in which Point it differeth from all the *Balani* I have ſeen: It hath no Spiral Circumvolutions nor Apex, but it openeth at both ends; the Orifice of the upper end is narrower, and it is through it that it puts forth its *Cirrhi* or *Brachia*. The Orifice of the lower end is much broader, and the Animal is lodged in it. The lower is divided, as *Boccone* obſerveth, into eighteen Lines, which are raiſed, twelve of them are ſimple and ſtraight, and the other ſix are branched: The laſt are ſo placed, that two ſtraight Lines are betwixt each of them. There is a Cavity betwixt all of them, in which the *Cirrhi* or Arms of the Animal are probably placed, though in this ſubject they ſtood in the middle of the upper part of the Shell, with their ends contracted as the Figure ſheweth them; for the upper Orifice is deeper than the lower. They are altogether within it, but we raiſed them with the Leg of a Compaſs to the Poſture they appear in the Figure. There is an opening from the under part to the upper, by which theſe *Cirrhi* mount from the Head of the Animal. The Orifice of the upper part is narrow below, but wide in the middle, and then again contracts ſomewhat. The Body of the Shell is Convex; it hath ſix Diviſions, each conſiſting of four Tubes extuberant; which are narrower at the upper end, but grow ſenſibly wider towards the lower end: The utmoſt of theſe Tubes are narrow, the middle are broader, all of them have *Striæ* croſſing them; the Diſtances betwixt the Parts of them are ſmooth and appear hollow; the Superficies of them are wider at the Top and grow narrower ſenſibly towards the Bottom. All the Tubes are hollow in the inſide, making Cavities betwixt the Lines, both ſimple and branched, which compoſe them. They ariſe from the Orifice in the middle of the inner Part of the Shell, and proceed toward the ſides of it; the branched Part is neareſt the ſide of the Shell. This is what I could obſerve of the Shell, upon both the outer and inner ſide of it. To come now to the Animal: In the upper Part it appear'd like a Mouth gaping; the upper and lower Parts were both ſemicircular, but narrower towards the Point of the Overture: They were membranaceous; and took their Riſe from the inſide of the Shell. The upper Lip, if I may ſo call it, was altogether membranous, the lower ſeemed of an oſſeous conſiſtence towards the Shell, and appear'd like the *Dentes molares*: A little below the Mouth appear'd the *Cirrbi*, which were continued with the reſt of the Body of the Animal. I doubt not but when the Animal is alive, the under part below the *Cirrbi* doth reſemble the under part of the *Molluſci* of the *Polypode* kind: This did reſemble the *Parenchyma* of a *Buccinum*, but was much firmer, and when it was preſſed it yielded a fat Juice; it was white without, but blackiſh where it adhered to the Shell; it was all drawn up within the under part of the Shell, which it filled: It was ſomewhat exſiccated, and ſo I could not perceive any diſtinction of parts in it, tho ſome are of opinion there may be *Viſcera* and Veſſels traced in it when the Animal is newly taken. This is what I could obſerve of the *Parenchymous* ſubſtance in the lower part. In the Figure are two Sinewy Bodies, which ariſe from the ſides of the upper part of the Shell, the one exactly oppoſite to the other; they end as it were in two Claws; by theſe it is like the Animal attacheth it ſelf to any thing; and by theſe it hung to the Whale; it can dilate and contract them as it pleaſeth.

Of the Uſefulneſs of the Silk of Spiders, by Monſ. Bon. *n.* 325. *p.* 2.

XXIV. I ſhall reduce all the different ſorts of Spiders to two principal kinds, *viz.* ſuch as have long Legs, and ſuch as have ſhort ones: The latter of which furniſhes the Silk I am now ſpeaking of. In reſpect of their particular differences, they are diſtinguiſh'd by their Colour, ſome being Black, others Brown, Yellow, Green, White, and others of all theſe ſeveral Colours mixt together. They differ likewiſe in the Number and Poſition of their Eyes; ſome having ſix, others eight, and others ten, differently placed upon the top of the Head, as may eaſily be ſeen by the naked Eye, but much better by the help of a Glaſs. Theſe are the principal Differences, they being alike in other reſpects as their Body, which Nature has divided into two parts: The forepart is covered with a Shell or hard Scale ſet with Hairs; it contains the Head and Breaſt, to which are fix'd its eight Legs, each of them conſiſting of ſix Joints. They have likewiſe two other Legs, which may be called their Arms; and two Claws, armed with two crooked Nails, and joyned by Articulations to the Extremity of the Head: With theſe Claws they kill the Inſects they feed on, their Mouth being immediately underneath them. They have likewiſe two ſmall Nails at the End of each Leg, and a ſpongy Subſtance between them, which undoubtedly is of Service to them when they go upon ſmooth Bodies. The hinder Part of the Body of this Inſect is joyned to the fore-part only by a ſmall Thread, and cover'd with a thin Skin, on which are Hairs of divers Colours: It contains the Back, Belly, Parts of Generation and the *Anus*.

It is certain, that all Spiders ſpin their Thread from the *Anus*; about which there are five *Papillæ*, or ſmall Nipples, which at firſt ſight one would take for ſo many Spindles, that ſeem to form the Thread: I have found theſe *Papillæ* to be Muſcular, and furniſhed with a Sphincter. A little within theſe I have obſerv'd two others, from the middle of which iſſue ſeveral Threads, in a pretty large quantity, ſometimes more, and ſometimes leſs, which the Spiders make uſe of after a very Mechanical manner, when they have a mind to go from one place to another. They hang themſelves perpendicular by a Thread, and turning their Head towards the Wind, they ſhoot ſeveral others from their *Anus*, like ſo many Darts: And if by chance the Wind, which ſpreads them abroad, faſtens them to any ſolid Body, (which they perceive by the reſiſtance they find in drawing them in from time to time with their Feet) they then make uſe of this kind of Bridge to paſs to the place where their Threads are fixt. But if theſe Threads meet with nothing to fix on, the Spiders continue to let them out further, until their great length, and the force with which the Wind drives them, ſurpaſſing the weight of their Bodies, they find themſelves to be ſtrongly drawn; and then breaking the firſt Thread, which they hung by, they let themſelves looſe to be driven by the Wind, and flutter on their Backs in the Air with their Legs ſtretch'd out. And by theſe two ways it is, that they paſs over Roads, Streets, and the largeſt Rivers. One may himſelf wind up theſe Threads, which by reaſon of their being united together, ſeem to be but one when they are about a Foot in length; but I have diſtinguiſh'd them into 15 or 20 at their iſſuing from the *Anus*. What is further remarkable, is the eaſineſs with which this Inſect moves its *Anus* every way, by means of the Rings that border upon it. This is abſolutely neceſſary for 'em, in order to wind up their Threads or Silk, which in the Female Spider is of two ſorts.

The firſt Thread that they wind is weak, and ſerves them for no other uſe than to make that ſort of Web, in which they catch Flies: The ſecond is much ſtronger than the firſt; in this they wrap up their Eggs, and by this means preſerve them from the Cold, and ſecure them from ſuch Inſects as would deſtroy them. Theſe laſt Threads are wrapt very looſely about their Eggs, and reſemble in form the Bags of Silk-Worms, that have been prepar'd and looſen'd between the Fingers in order to be put upon the Diſtaff. Theſe Spiders Bags (if I may ſo call them) are of a Grey Colour when they are new, but turn blackiſh when they have been long expoſed to the Air. It is true, one may find ſeveral other Spiders Bags of different Colours, and that afford a better Silk, eſpecially thoſe of the *Tarantula*; but the ſcarcity of them would render it very difficult to make Experiments upon them; ſo that we muſt confine our ſelves to the Bags of ſuch Spiders as are moſt common, which are the ſhort Leg'd ones. Theſe always find out ſome Place, ſecure from the Wind and the Rain, to make their Bags in; as hollow Trees, the Corners of Windows or Vaults, or under the Eaves of Houſes. And by getting together a great many of theſe Bags, it was that I made this new Silk, which is no ways inferior in Beauty to common Silk. It eaſily takes all ſorts of Colours; and one may as well make large pieces of it, as the Stockings and Gloves which I here preſent you. I ſhall next proceed to ſhow the manner how I prepared the Bags to make the Silk.

After I had got together twelve or thirteen Ounces of theſe Spiders Bags, I beat them well for ſome time, with the Hand and a ſmall Stick, to free them from Duſt. Then I waſhed them in warm Water, till the Water that came from them was clear. After this, I let them ſteep in a large Pot, with Soap, Saltpetre, and ſome pieces of Gum-Arabick; and let the whole boyl two or three Hours over a gentle Fire. Then I waſhed them again with warm Water, to free them from the Soap: And having let them dry for ſome Days, I looſen'd them a little between the Fingers, that they might be more eaſily carded by the common Silk Carders, excepting that I cauſed them to uſe much finer Cards. By this means I had a Silk of a very particular Aſh-colour, which is eaſy to be ſpun, and affords a Thread much ſtronger and finer than that of common Silk. Which ſhows, that all other ſorts of Work may be made of it: And there is no reaſon to fear but that it will endure any Tryals of the Loom, after having paſſed that of the Stocking-Weavers. The only Difficulty now lies in procuring a ſufficient quantity of Spiders Bags to make any conſiderable Work of it. And this would be no difficult Matter, if we could breed Spiders as they do Silk-worms; for they multiply much more, and every Spider lays 6 or 700 Eggs, whereas the *Papilio*'s, or Flyes of Silk-worms lay but 100, or thereabouts: And of this Number we muſt abate at leaſt half on account of their being ſubject to ſeveral Diſeaſes, and are ſo tender, that the leaſt Matter hinders them from making their Bags. Whereas on the contrary, the Spiders hatch of themſelves, without any Care, in the Months of *Auguſt* and *September*, in fifteen or ſixteen Days after they are laid; and the Spiders that laid them die ſome time after. As for the young Spiders that are bred from theſe Eggs, they live ten or eleven Months without eating; and continue in their Bags, without growing either bigger or leſs, till the hot Weather forces them to come forth and ſeek Food. The Reaſon of this is plain and natural: For all Inſects, and a great many other Animals, as Bears, Serpents, Mountain Rats, *&c.* that lye hid during the Winter, abound with a viſcid Matter, which is not eaſily put in Motion: So that it is not ſtrange, that young Spiders ſhould live in the cold Weather upon their own Subſtance, without Loſs of their Spirits. But as ſoon as the warm Weather comes, it puts in Motion this Matter, and forces them to ſpin, and run from place to place in ſearch of Food: And as ſoon as they begin to eat, one may perceive them to grow bigger and bigger every Day. From whence we may certainly conclude, that if we could find a way of breeding young Spiders in Rooms, they would furniſh us with a much greater Quantity of Bags than Silk-Worms do: For I have always found, that of 7 or 800 young Spiders; there ſcarce died one in the Year; and on the contrary, of a hundred young Silk-Worms, not forty liv'd to make their Bags.

I ordered to be brought to me all the large ſhort-leg'd Spiders that could be found in the Months of *Auguſt* and *September.* Theſe I ſhut up in Papers, and put them into Pots, and covered the Pots with a Paper prick'd full of Holes with a Pin, as were likewiſe the ſeveral Papers that were in it, that the Spiders might have Air. I fed them with Flies; and ſome time after found, that the greateſt part of them had made their Bags. But I more eaſily procured a great quantity of them, by promiſing to pay the ſame Price for them by the Pound as for common Silk. This Advantage furniſhed me in a ſhort time with a large quantity: And they aſſured me, they found no Difficulty in getting them; and that if they were permitted to go into every Houſe, where they ſaw theſe Spiders Bags in the Windows, they could furniſh me with what I pleaſed. So that we may eaſily conclude, that there are Spiders Bags enough in the Kingdom to make large pieces of Work; and that this new Silk which I propoſe, is not ſo ſcarce or dear as common Silk was at firſt. And ſo much the more, by reaſon Spiders Bags, in reſpect of their Lightneſs, afford much more Silk than the others; as a Proof of which, thirteen Ounces yield near four Ounces of clean Silk; three Ounces of which will make a Pair of Stockings for the largeſt ſiz'd Man. Theſe here weigh but two Ounces and a Quarter, and the Gloves about three Quarters of an Ounce; whereas Stockings of common ſilk weigh ſeven or eight Ounces. It is certain a great Advantage may be made of this Inſect, which the Publick has always look'd on as troubleſome and dangerous, on account of its Venom; but I can aſſure you, notwithſtanding, that Spiders are not Venomous, having been very often bit by them my ſelf, without any ill Conſequence. And as for their ſilk, it is ſo far from having any Venom, that every body makes uſe of it to ſtop Bleeding and heal Cuts; and indeed its natural *Gluten* is a kind of Balſam that cures ſmall Wounds, by defending them from the Air.

Their Silk is uſeful, not only in reſpect of the Manufacture it produces; but its Uſefulneſs is much greater, and more eſſential, on account of the ſpecifick Medicines, that may be drawn from it. It yields by Diſtillation a great quantity of Spirit and Volatile Salt; and I have found by comparing, that it affords at leaſt as much as common Silk; which of all mixt Bodies yields the moſt. This Salt and volatile Spirit, which is drawn from Spiders Bags, is very active; as may be judged by the following Experiments. It changes the Tincture of the Flowers of Turnſole into a beautiful green Emerald Colour. It congeles, and reduces to a ſort of Snow, the Diſſolution of Corroſive ſublimate; whereas the Volatile Alcalies drawn from Human Scull, Hartſhorn, and divers other mixt Bodies, only render it white or milky. So that this new Alkali which I propoſe, being prepared after the ſame manner as that which is drawn from the Bags of Silk-Worms, in making the *Engliſh Drops*, ſo famous over all *Europe*, may ſerve to make other new Drops, which may deſervedly be called *Drops of Montpellier*; which we need not ſcruple to make uſe of, with much greater Succeſs than the old ones, in Apoplexies, Lethargies, and all Soporous Diſeaſes, by reaſon of their great Activity: And they will be taken with leſs Regret, becauſe their Smell is not ſo fœtid and diſagreeable.

Explication of the Plates: Plate 18.

Tab. 1. *A* Shows the Belly of a Spider, with the *Anus* and five *Papillæ*, from whence the Threads iſſue. *B C* The ſide, and fore-part of the *Penis* of a Spider, as magnify'd by a Microſcope. *D* The Follicle or Bag of a Field-Spider with a harder Shell, at the breaking of which the young Spiders come out mixt with the Silk. *E* The Follicle or Bag of an Houſe-ſpider with a ſofter ſhell, in which the young ones are incloſed.

Tab. 2. *F* A Spider hanging on the Branch of a Tree, with its Head turned againſt the Wind, and ſpinning out its Thread, till it finds that it adheres to ſome Body, (as to the Wall here repreſented) by which kind of Bridge it paſſes over Rivers, *&c.* G A Spider having broke the firſt Thread, by which it hung, and let out ſeveral others, is carried by the wind, and floats in the Air with its Legs extended.

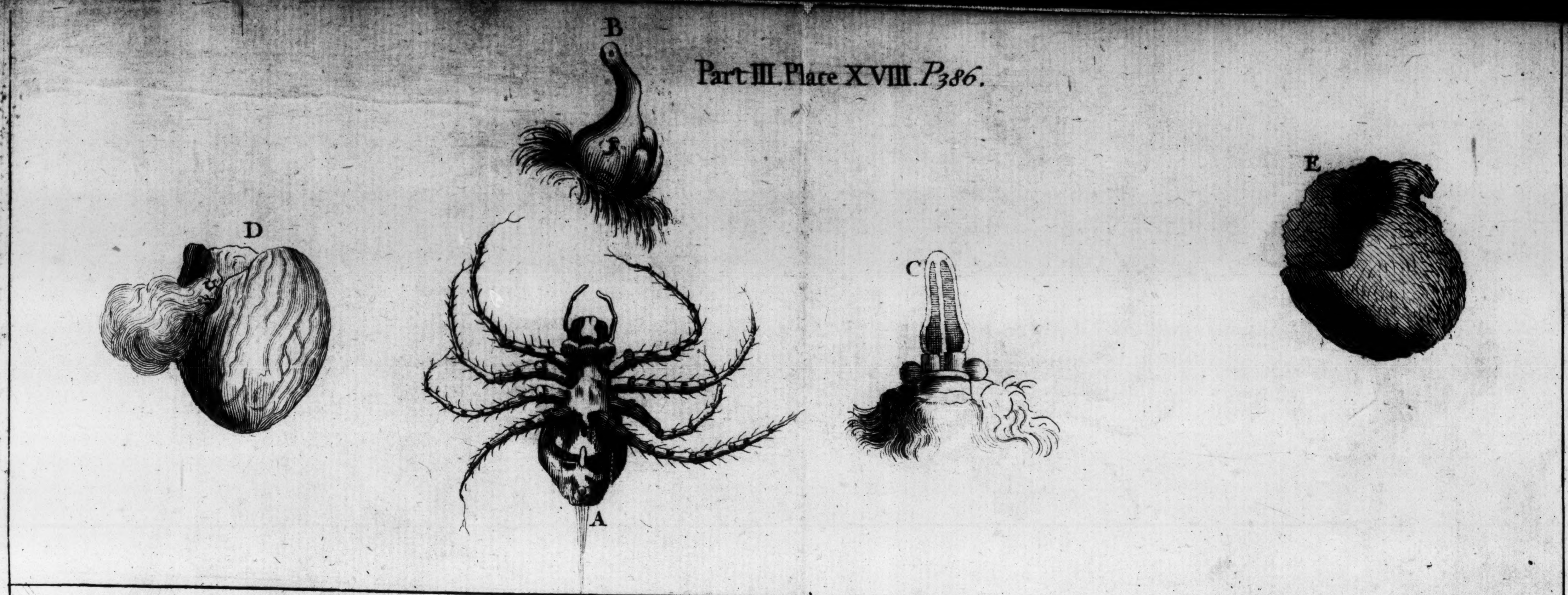
Of the Production of Silk Worms, and of their Silk in England, *by Mr.* Barham, *n.*362.*p.*1036.

XXV. *April* 27. 1719. I received a ſmall parcel of Silk-worms Eggs from *Languedoc*.

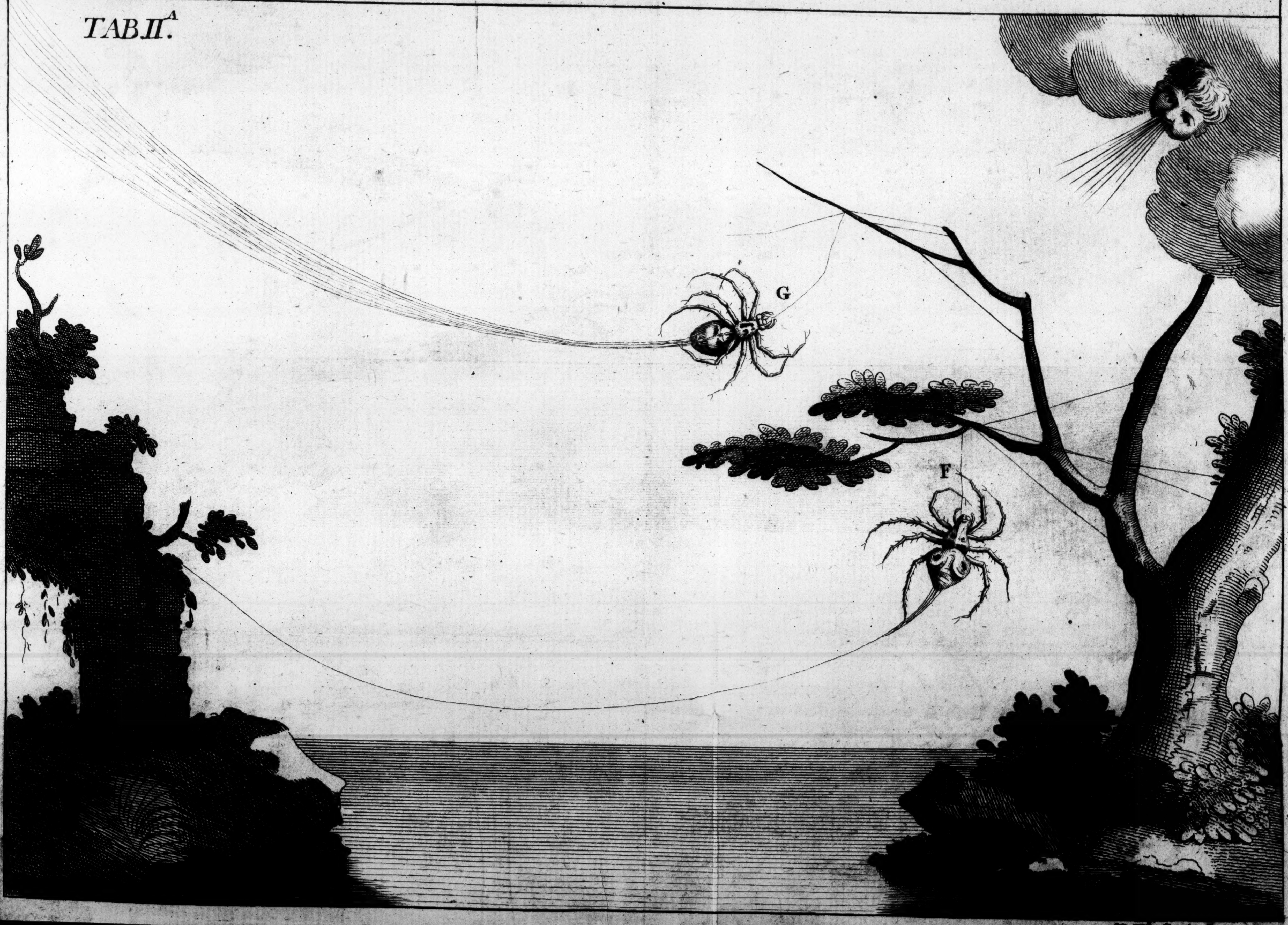
May 6. Early in the Morning I found them hatcht of themſelves, the Wind ſhifting in the Night from Eaſt Northerly to the Weſt-Southerly, changing the Air of a ſudden to warm, two Days before the Change of the Moon.

After feeding and managing them according to Art, through the whole Courſe of their four Sickneſſes, they were come to their State of Perfection, being then as thick as a Man's little Finger, and from four to five Inches long, of a yellowiſh Colour, and when held againſt the Light, they might be ſeen through as you may an Egg, being of the ſame Colour and Conſiſtence (fill'd with the Matter that makes the Silk) This is a certain ſign that they will begin to ſpin in twenty four Hours or leſs. They then forſake their Food (being very voracious before) and hunt about for a convenient Place to fix their firſt Hold-faſts, for ſupporting the Balls or Cones they are to make, which they do in a moſt wonderful Mathematical Manner, with a Mixture of a Gummy Subſtance that tyes all together; and when the looſe furzy ſubſtance is taken off, and ſome of the ſilk is wound off, the Remainder is ſo ſmooth and compact, ſhining like *Sattin*, that they are made uſe of for Artificial Flowers, and eſteemed the beſt of any thing yet known for that purpoſe, for which (only) they are generally kept in *Boarding Schools*. I weighed many hundreds of theſe

Part III. Plate XVIII. P386.



TAB. II.A



M. V^dr Gucht Sculp.

Silk-Balls or Cones, which I found to weigh from 35 to 40 Grains with their *Aurelia*'s or *Chryſalis* within them.

June 27. They begun to ſpin, having been hatcht ſeven weeks and three days; and in four or five days finiſhed their laborious and curious work: but their Balls were not fit to be removed until eight or ten days.

July 7. *Monſ. Lachivre* began to wind off their Silk-Balls with a Machine that made a great Diſpatch, winding much fine Silk in a Day: I found that an Ounce of Silk-Balls would make about a Dram of fine Silk; but to be more certain, I weighed out to the Winder twelve Pounds of Silk-Balls at four times, and told the Balls in every three Pounds as followeth, *viz.*

The firſt 3 Pound contained 812 Balls.
The ſecond 3 Pound contained 842
The third 3 Pound contained 797
The fourth 3 Pound contained 868

So that the whole 12 *lib.* Weight contained 3319 Balls. Which when wound off, was found to yield and make one Pound and one Ounce, or 17 Ounces of fine Silk, and about 7 Ounces of coarſe Refuſe unwound, in all a Pound and half of *Averdupois* Weight, or two Pounds *Troy*; which is as great or greater making or yielding as in any Part of the World, and the Silk as fine. I ſhewed it to a noted *Silk Broker*, who ſaid it was *Italian Silk*, (not knowing it was made in *England*) and worth about twenty ſhillings *per* Pound, if I had never ſo many Bales of it, *&c.*

Now upon this Experiment finding that 3319 Silk-Balls would make one Pound and one Ounce of fine Silk, I was deſirous to know what quantity of Silk might be expected from the Worms hatched from one Ounce of Eggs. Of which to obtain the Knowledge, I made uſe of the following Method: by often weighing and telling I found that one hundred Eggs weighed but one Grain, ſo that if one Grain contains 100, a Scruple muſt contain 2000, and a Dram 6000, and an Ounce, at 8 Drams to the Ounce, muſt contain 48000 Eggs. Now if every Egg hatch a Worm, and every Worm makes a Silk-Ball, there muſt be from one Ounce 48000 Silk Balls; and if 3319 Balls will make one Pound and one Ounce of fine Silk, (which by Experience I found they did) then 48000 Silk-Balls will make 15 Pounds and 6 Ounces of *Averdupois* Weight in fine Silk, or 18 Pounds and 8 Ounces of *Troy* Weight, which is very conſiderable. And in the ſame Proportion one Pound of Silk Worms Eggs, will produce Worms ſufficient to make above 180 Pounds of Silk. But allowing for Caſualties, and ſuppoſing but 12 Pounds of fine Silk made from the Worms and their Silk-Balls produced from an Ounce of Silk Worms Eggs; it will be found much to exceed moſt Countries, according to *Auguſtino Gallo*'s Computation: For he ſaith, that in the Southern Parts of *France, viz. Languedoc* and *Provence*, they make but ſeven or eight Pound of Silk from Silk-

Worms hatched from an Ounce of Eggs; and in *Breſcia* in *Italy*, but eight, nine, or ten Pound of Silk from an Ounce; only in *Calabria*, where the Silk-Worms and their Eggs are larger, they make eleven or twelve Pounds of Silk from an Ounce of Eggs; which ſtill doth not exceed, nay hardly comes up to, what we make in *England*. Experience hath taught me how to hatch Silk Worms twice in a Year, ſo as to have two good Crops of Silk in one Year. And that Mulberry Trees will have Leaves in *England* twice in a Year, without Prejudice to either Tree or Fruit, is moſt certainly true.

Of Inſects in the Barks of decaying Elms and Aſhes. by Sir Matthew Dudley, *n.*296.*p* 1859.

XXVI. About five or ſix Years ſince, I removed divers Elms, more than ſix Inches Diameter, which for the firſt two or three Years all thrived very well; but two or three Years ago there happening a very dry time in *July* or *Auguſt*, I obſerved one of thoſe Elms which ſtood very ſhallow, and on pretty high Ground, looked very ſick; the Leaves turned yellow, and began to fall off; which made me with a Knife examine the Bark. I found the inſide thereof not ſo green, but of a more reddiſh Colour than the others; and between it and the Tree not ſo moiſt, and the Bark ſticking very cloſe to the Wood: But what was moſt remarkable, I diſcerned a great many little black Flyes of the Beetle kind (*viz.* having a hard Caſe, under which their thin long Wings were contracted, and therewith covered) between the Bark and the Tree: And looking more carefully, I obſerved theſe Flies had made their way thither by piercing the Bark in innumerable places, eaſily diſcernable on the outſide, and was about the bigneſs of a large Pin hole, or rather ſuch as a large Pin's head would go into; ſome I found juſt entring, who had not got quite through the Bark; others had made ſome Progreſs between the Tree and the Bark, which appeared as a Channel. I deſpaired of recovering the Tree; however, my Servants being watering others, I cauſed them to beſtow about two Hogſheads on this Tree, with ſtirring the Earth about the Roots, and laying ſome half rotten Litter thereon, to defend it from the ſcorching Rays of the Sun: Upon this the Tree in ſome manner recovered its Verdure again that Year, and the next Year made very good Shoots, and ſo continued until this Year.

But this being a very dry Summer, I diſcern'd divers of my Trees in the beginning of *Auguſt* to look ſick, and particularly the Tree formerly mentioned; I made the ſame Tryal on them all, and found the Bark ſticking cloſe to the Tree, with but little Moiſture between, and vaſt Numbers of thoſe little Flyes, who had pierced the Bark in multitudes of Places. I ordered the Earth about the Roots to be looſened as formerly, and about two Hogſheads of Water to be poured on each, and viewing them the next morning, I found the outſide of the Tree almoſt covered with Bees and Waſps, and great black Flyes, ſuch as they uſually call Fleſh-flyes; who were all buſie in ſucking the Juice or Sap, which plentifully run out at every Hole that the little Flyes formerly mentioned had made in the Bark, and which was very Glutinous, and ſweet as Honey. I again examined the Bark, and found it very moiſt between it and the Wood, and all thoſe little Flyes either gone, or drown'd in their new habitation, by the ſudden riſe of the Sap; this Tree recovered. Upon Examination of ſeveral Trees, which looked ſicker than the reſt, I found almoſt all greenneſs had left the Bark, and there remained no moiſture between it and the Wood; but the Bark ſtuck ſo cloſe to the Wood it was hardly to be parted: And throughout the whole Tree the Bark was pierced by the aforementioned little Flyes, who from the hole at which they entred, had made each of them a ſtrait perpendicular Channel from their entrance upwards, about two Inches long, or ſomething more, very little, if at all, bigger than juſt to move themſelves ſtrait forwards in; for I obſerved they all of them, if diſturbed, came out backwards. All along on each ſide this Channel, as cloſe the one to the other as they well could, ſo as yet to be diſtinct, there were ſmall Channels running Horizontally from it, in every one of which at the extremity thereof there was a Maggot, in ſize juſt the bigneſs of the ſmall Channel, very lively, whitiſh, and almoſt tranſparent. Theſe Trees, tho well watered, received no benefit thereby but dyed. It is to be obſerved, that in thoſe Trees whoſe Leaves looked Green and Healthful, there was none of theſe Flyes to be found.

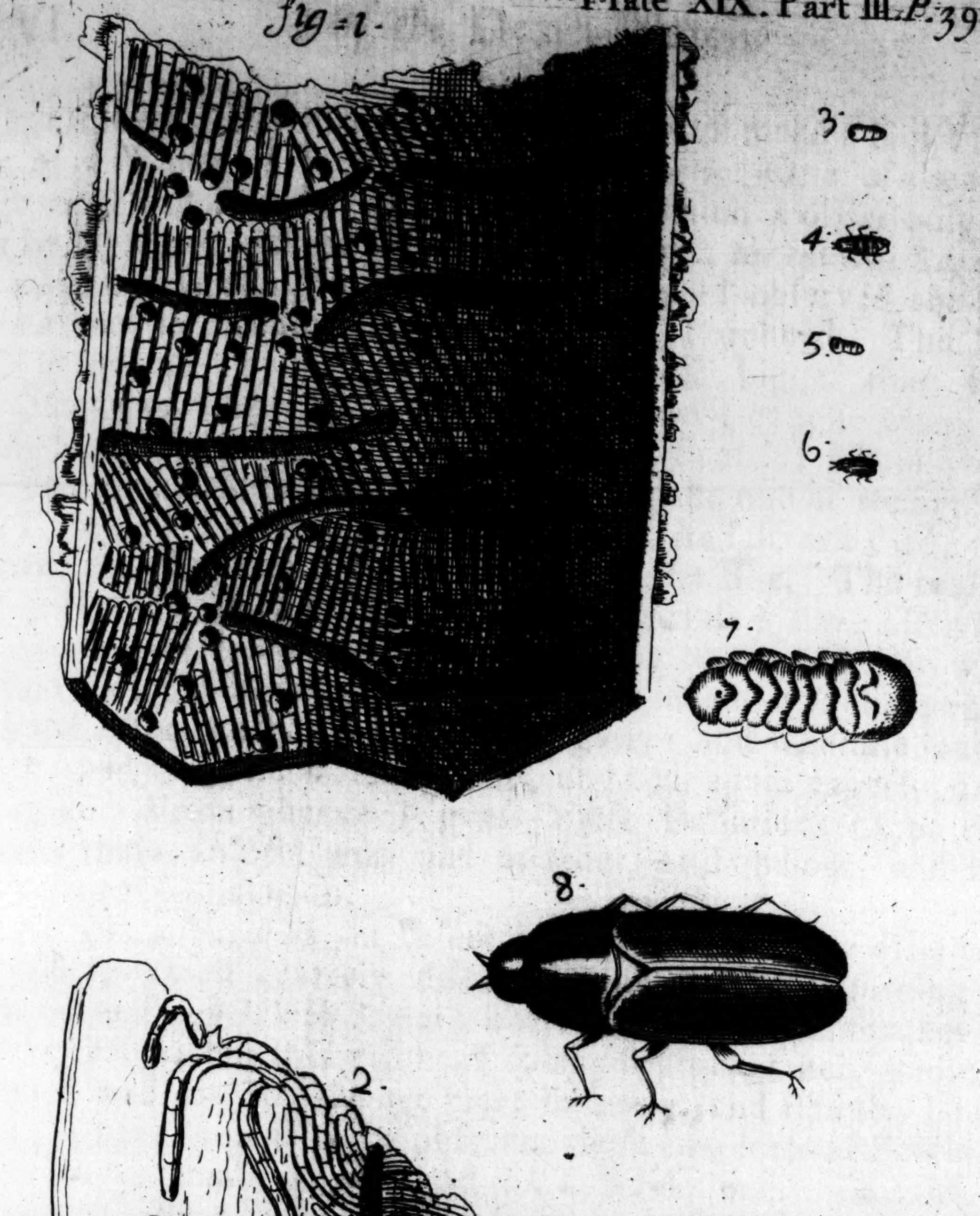
The Reaſon of which I preſume to be, that whilſt there was a ſufficient Moiſture in the Earth about the Roots, to ſupply the Tree with a due quantity of Sap, ſo thin and diluted that it was proper, and capable of being conveyed into the ſmalleſt Twigs and Leaf-Veſſels, the Leaves kept their Verdure, and the Tree flouriſhed: But when, by reaſon of the dry ſeaſon, that ſupply failed, and the Sun perpetually exhaling the thinneſt and more watry parts thereof through the Bark, the Sap already in the Tree became inſufficient in quantity, as well as improper, by reaſon of its thickneſs, to ſupply or enter into all thoſe ſmall Veſſels: the Leaves loſt their Greenneſs, and fell off, and the Sap became thick and very ſweet, (which I have found it is not when it is duly diluted, and the Tree in good health;) this invited thoſe Flyes to make their way to it, as a proper Nurſery to bring up their young ones; which I take thoſe little Maggots to be. I preſume alſo, that the Eggs were firſt laid in the great Channel, (and, it may be, regularly placed at their due diſtances, in the ſides thereof) and after being hatched, made thoſe ſmall Channels themſelves; ſince thoſe ſmall Channels are no way capable of receiving the Old Fly, and that the Maggot is always found at the farther end of the little Channel, and the reſt of the little Channel is perfectly filled with very ſmall Particles, which, when dry, became fine Duſt; and I conceive to be either the Excrements of the Worm, or parts of the Bark ground ſmall by the Teeth of the Worm, to make its way forwards, and rejected as not proper Aliment, or both.

About the middle of *October* I found thoſe little white Maggots, and conſequently their Channels, which they exactly filled, were grown much bigger, and had made their progreſs from the place where they were firſt hatched, which was cloſe to, or upon the very Wood of the Tree, almoſt to the very outſide of the Bark of the Elm, which is uſually pretty thick; and in every one of thoſe Perpendicular Channels before mentioned, I found the Mother Fly lying dead, for the moſt part towards the entrance of the ſaid Channel. Theſe Obſervations put me upon viewing the Wood, which lay in my Yard for Timber or Fewel, and in all the Elm which was felled laſt Spring, I found the Bark thereof as much pierced; the ſame Mother Channel, which for diſtinction ſake, I beg leave ſtill, tho improperly, to call Perpendicular (for theſe Trees lay on the Ground) and the ſame little (now as improperly called Horizontal) Channel proceeding from the Mother Channels full of Maggots, which Maggots had alſo made their way almoſt to the outſide of the Bark. Obſerving ſome Elm, which had lain much longer in the Yard, and taking off the Bark, I found the ſame tracks both of Mother Fly and Maggots; and that, at the extremities of almoſt all the Horizontal Channels made by the Maggots, where they had ſubſiſted long enough to come to any perfection, the Bark was pierced quite through, by a hole juſt the bigneſs of the Channel, and nothing left remaining, but a ſort of a whitiſh pretty tough Skin, exactly the Colour and ſize of the Maggot, at the mouth of the hole, and the reſt of the forſaken Channel perfectly filled with what I formerly preſum'd to call the Excrement of the Maggot.

Then I examined the Aſh-wood, which had lain ſome time in the Yard, and at firſt ſight, it being young, and its bark pretty ſmooth, I perceived it full of ſmall holes; and on ſeparating it from the Tree, I found juſt the ſame ſort of work as in the Elm, and by the ſame ſort of Fly, having found ſeveral of the Mother Flyes dead in their Channels, and the ſame empty Skins at the extremities of the other Channels; only with this difference, that whereas in the Elm all the Mother Channels were Perpendicular, and the Maggot Channels Horizontal, here in the Aſh it was juſt contrary, all the Mother Channels were Horizontal, and the Maggot Channels Perpendicular; this I at firſt thought might be accidental, and peculiar to that piece of Wood, but on examination of above 100 pieces of Wood of different Trees, and felled at different times, I found it exactly to hold true in them all. I obſerved ſeveral Oak and Maple Trees, which had been felled ſome in Winter and ſome in Summer, and the Bark remaining thereon, but could find no ſuch thing in either of them.

Explanation of the Figures. Plate 19. *Fig.* 1. ſhews the Bark of Aſh. *Fig.* 2. The Bark of Elm. *Fig.* 3. The Worm as big as the Life lying on its Back. *Fig.* 4. The Mother Fly, with its Belly upwards, as big as the Life. *Fig.* 5. and 6. The Worm and the Fly with their Backs upward. *Fig.* 7. and 9. The Worm Magnify'd. *Fig.* 8. The Mother Fly Magnify'd.

Plate XIX. Part III. P. 390.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Death Watch
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Of the Death-Watch, *by Mr.* Derham, *n.* 271. *p.* 832.

XXVII. Of theſe *Death-Watches* (or Inſects which make a Noiſe like the Beats of a Watch) I have obſerved two ſorts. One of them I find a very exact and true Account of *, from which I differ only in this, that he ſays, the ticking Noiſe is made with *the extreme Edge of the Face, which may be called the upper Lip*: whereas I obſerved the Inſect to draw back its Mouth and beat with its Forehead. The Inſect there deſcribed, being leſs ſhy, and much bigger than the other, I diſcovered ſome Years ago. This Year I caught many in *May*, in my Study: two of which (a Male and Female) I kept alive in a little Box about three Weeks; and could make one of them beat whenever I pleaſed, by imitating his Beating. At laſt one died, the other gnawed his Way out through the ſide of the Box. The reaſon why I judge theſe to be Male and Female is, becauſe I have often by my Ticking noiſe invited the Male to get up upon the other in way of Coition. That which I took to be the Male was ſomewhat leſſer than the other, he would beat very eagerly; and when he found that he got up in vain, he would get off, and beat again eagerly, and then up again. From whence I gueſs theſe Pulſations to be the way whereby theſe Inſects woo one another, and find out, and invite each other to Copulation.

The other *Death-Watch* is an Inſect in appearance quite different from the laſt; which I lately diſcovered about the beginning of *July*. The other *Death-Watch* beateth only ſeven or eight Strokes at a time, and quicker: but this will beat ſome Hours together, without Intermiſſion; and his Strokes are more leiſurely, and like the Beats of a Watch. I have ſeveral Years obſerved theſe two ſorts of Beating, but took it to be made by one and the ſame Animal. The Inſect which makes this long Beating, is a ſmall greyiſh Inſect, much reſembling a Louſe, when looked on only with the naked Eye. For which Reaſon (for want of another Name) I call it *Pediculus Pulſatorius*. It is very nimble in running to ſeek its Shelter, when diſturbed. It is very common in all Parts of the Houſe, in the Summer Months. They are extremely ſhy of Beating, when diſturbed; but will beat freely enough before you, and alſo anſwer you when you beat, if you can view them without giving them Diſturbance, or ſhaking the Place where they lye, *&c.* I cannot tell whether they beat in any other thing, but I have heard their Noiſe only in, or near Paper.

Concerning their Noiſe, I am ſomewhat in doubt, whether it be made by their Heads, or rather Snouts againſt the Paper: or whether it be not made after ſome ſuch manner, as Graſhoppers and Crickets make their Noiſe. I rather incline to the former Opinion. But my reaſon of Doubting is, becauſe I have obſerved the Animal's Body to ſhake, or give a ſudden Jirk at every Stroke, but I could ſcarce perceive any Part of its Body to touch the Paper. 'Tis poſſible it might beat the Paper, and I not perceive it, by reaſon its Body is ſmall, and near the Paper when it beateth, and its motion in beating is ſudden and ſwift. For which Reaſons alſo it is hard to perceive the Inſect to beat, without a very ſevere Eye: And therefore I made uſe of a Convex glaſs, which by magnifying gave me much better Opportunity of obſerving. This ticking Noiſe, I judge (as before) a Wooing Act; by reaſon I obſerved another (after much beating) to come, and make Offers to the beating Inſect; who (after ſome Offers) left off his beating, and got up upon the Back of that other. When they had conjoyned, he got off again, and they continued ſome Hours joyned Tail to Tail like Dog and Bitch in Coition. The Female (which I ſaw) was ſomewhat bigger than the Male, and lighter in Colour (inclining to a yellow:) but whether all are ſo, I know not.

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* *Phil. Tranſ. n.* 245. *Abr. Vol.* II. *p.* 785.

I have often heretofore by the Noiſe purſued the Makers of it; but have thought my ſelf diſappointed, when I found nothing but ſome of theſe *Pediculi*, which I did not perceive to beat, and which I little imagined could have made ſo ſonorous a Noiſe, as I have heard ſome of them do, even as loud almoſt as the ſtrongeſt Beats of a Pocket-Watch. But lately finding a piece of Paper in my Study, in which I was ſure the Beating was, and it being luckily looſely folded, ſo as to be viewed throughout, and alſo happening to lie in a good Light, I ſtrictly viewed it, but could only ſee ſome of thoſe *Pediculi*. And viewing them with a Convex-Glaſs, I ſoon perceived ſome of them to beat, or to make a Noiſe, with a ſudden ſhake of their Body, as hath been deſcribed. And I am now ſo uſed to, and ſkilful in the matter, as to be able to ſee, and ſhew their Beating, almoſt when I pleaſe, by having a Paper with ſome of them in it conveniently placed, and imitating their Pulſations; which they will readily anſwer. Whether this Inſect changeth its ſhape, and becometh any other Animal, I know not: but I have ſome Cauſe (tho very little) to ſuſpect that it becometh a ſort of Fly.

*n.*291.*p.*1586.
Plate 19.

Fig. 9. Sheweth it as ſeen with the naked Eye: Fig. 10. as magnified. It is very much like a Louſe in Shape and Colour, but runneth more nimbly.

Its Generation.

Some time after their Copulation (of which by and by) they lay their Eggs in dry, duſty Places, where they meet with leaſt Diſturbance. For in ſuch, and none elſe, I have found them. Theſe Eggs are exceeding ſmall, much ſmaller than the Nits of Lice; although Lice are not much bigger than our Inſect is. Theſe Eggs are white and ſhap'd like Nits, but more tranſparent. Theſe (as the Eggs of all Inſects, that have fallen under my Cognizance, are by the warmth of the Weather) theſe, I ſay, are hatched by the Warmth of the approaching Spring, which is to them all one as an Incubation. About the beginning of *March*, or (if the Weather be warm) ſooner, if cold and unſeaſonable, later, the Inſect is fully hatched, and can creep about. At the firſt leaving their Egg-ſhell, they are exceedingly ſmall, ſo as ſcarce to be diſcerned by the ſharpeſt Eye, without the help of a Convex-Glaſs. I have with a Microſcope ſeen them crawling about, but could ſcarce perceive any Hairs, Feet, *&c.* But they rather look'd like moving Eggs. I ſuppoſe they were covered with their Shells, and but juſt breaking out of them. At the firſt leaving their Shells they are leſſer than their Eggs, although the Eggs are ſcarce viſible without a Microſcope. Theſe young Death-Watches are perfectly like the Mites in Cheeſe, a few Hairs of the Breech only excepted. I could not perceive any Difference between them, when much magnified with a Microſcope, but only that Mites have more Briſtles about their Breech.

In this Shape they continue ſix Weeks, or two Months, feeding on divers things they can meet with. They being (as I ſaid) ſo very like Mites, I cannot poſitively ſay, but have great reaſon to think, that they were Swarms of young Death-Watches, which I have ſeen feeding on dead Flies, and other things in *March*, *April* and *May*. Indeed they are a great Annoyance to me, in devouring or defacing my Specimens of Inſects. And there are ſcarce any ſorts that eſcape theſe voracious, tho minute Animals.

From this *Mite State*, they grow gradually to their more *perfect State.* When they become like the old ones, they are at firſt very ſmall, and then can run about more ſwiftly, than when Mites, in which Mite-ſtate, they creep but ſlowly.

Thus having traced the Generation of our Inſect through its ſeveral ſtages, and finding it to be as ſolemn and regular as any in Nature, even as that of an human *Fœtus* it ſelf, I cannot eaſily paſs over the Buſineſs of *Æquivocal Generation* without a Reflection. If this Inſect was ever taken Notice by the Ancients (as I do not find it was by them, and but little by the Moderns) they would, no doubt, have made its Production to be (like that of other Inſects, *viz.*) out of Duſt, or ſome other thing, in which its Eggs were laid. But as in this, ſo in the Generation of all other Inſects, yea all other Animals, it hath been obſerv'd, that Nature is very regular, and uniform in deriving the Off ſpring, not from corrupted Matter, but from Animal Parents of the ſame Species. I have collected near thirty diſtinct Species of Gnats, and have obſerved one Species to lay its Eggs, in this, another in that, another in a third, and others in other Forms; and I could not but admire how artificially the Spawns are tied in the Water; how (after the Sun's Incubation, if I may ſo call it) the Spawn is diſſolved, and the Eggs with a part of the Gelly in which they were incloſed, fall to the bottom of the Water, and there ſtick on Stones and other things; where they are hatched into *Nymphæ*, as various as the Gnats themſelves, ſome being red, green, white or other colour'd Worms, ſome of a quite different Shape; and laſtly, how theſe *Nymphæ* become *Aureliæ*, and then Gnats, both Male and Female of every Species.

Its Ticking Noiſe.

Their Ticking Noiſe is plainly a wooing Act, and is commonly about *July*. I ſcarce ever heard them beat before *July*. But all, or the greateſt part of *July* they beat, and in the beginning of *Auguſt*. I have heard them till *Auguſt* 16. but never later. But they do not beat every Year alike; but ſometimes ſooner, ſometimes later; ſometimes much, ſometimes little; according as the Year exciteth or favoureth, or hindereth their Venereal Inclinations. Of which we have ſufficient Example in the laſt, and preſent Year. The laſt Year 1702, they ticked very much ſcarce ever ceaſing either Day or Night. But this Year 1703 as little. And I have obſerved as great a difference in the Fertility of other Inſects the laſt and this preſent Year. And no doubt but the ſame befel our Death-Watch. The moſt remarkable Difference, or at leaſt the moſt perceivable was in Inſects bred in the Waters.

As to the Waters, it might be obſerved, that laſt Year they extreamly abounded with Animalcules. You could hardly find any ſtagnating Water without many Animalcules of many ſorts therein, viſible to the naked Eye. And if you viewed a ſmall Drop thereof with a good Microſcope, you might ſee very many more. So that the Water looked in a manner as if alive. But this Year I have found ſome, but very few of thoſe Animalcules, either without or with a Microſcope. The *Pediculi Aquatici* (which *Swammerdam* calls *Pulices Aquatici Arboreſcentes*) which are ſeldom barren, were for inſtance leſs numerous in our Waters this laſt Summer, than the Summer before, by many myriads, or at leaſt leſs venereally inclined, or leſs pregnant, as I judge, from there being vaſtly leſs numbers of them congregated together. For the reaſon of their aſſembling in ſuch vaſt Numbers ſo as to diſcolour the Waters, I have diſcovered to be either for Venery, or to diſcharge their Young at leaſt out of the Receptacles wherein they were lodged, or to caſt their *Exuviæ*, or Skins, or for all together. For I have ſeen all theſe things performed at that time, if I miſtook not. Now as theſe moſt numerous fertil Inſects, ſo our Death-Watch, in all probability, had its venereal Flames abated by the Indiſpoſition of the preſent Year; and conſequently (as I ſaid) have clicked but little this Year. The reaſon of all which I take to be the Wet of the Spring Months, eſpecially *May*, and *June* laſt. In the former of which, there fell more Rain here at *Upminſter*, than in any Month of any Year ſince 1696. This vaſt Wet might not only chill and ſpoil the Eggs of the Water Inſect, but alſo indiſpoſe the Air, and by ſome ſuch Means affect all other Inſects and render them leſs Prolifick.

After this Noiſe they copulate. I do not remember that ever I found them in Copulation, till a Week or Fortnight after their Ticking.

But 'tis very probable that they do copulate in the Time of their *Ticking*, as I have formerly ſhewn the *Scarabæus Death-Watch* to do.

Of the Food of the Death-Watch.

I have already ſaid that the young *Death-Watches* feed upon dead Inſects, and the ſame I have ſeen the old ones do alſo, as alſo upon divers other things, *viz.* Bisket, Tallow, *&c.* Nay, Duſt itſelf (although it may ſeem to us an improper Food for ſuch *Animalcula*) doth not eſcape the Palate of our *Death-Watch.* For which reaſon probably it is, that they delight moſt in duſty places, not in all, but ſuch as are fouled with light Duſt, ſuch as flyeth in ſweeping, and falleth on Shelves, and other places ſeldom bruſhed down. But in this their eating Duſt, there is one thing very remarkable, *viz.* their curioſity in chooſing it. For they do not eat all that they meet with, but are very nice, and curious in ſelecting what ſuiteth beſt their Palate. I have ſeen them turn the Duſt, and hunt among it with great pains and diligence. From hence I conclude, that our *Death-Watch*, and other Creatures too that eat Duſt, are not nouriſhed by the pure terrene particles of Duſt, but rather by more nutritive particles intermixed with Earth. For Duſt contains very different particles, ſome of Earth, ſome the Powder of Animals, ſome Crumbs of Bread, Cheeſe, and other Proviſions reduced to Powder, ſome particles of Fruits, or our Spittle, Snot, *&c.* dried and reduced in like manner to Powder. Now theſe very Particles of the Duſt are doubtleſs what the *Death-Watch* hunteth after (like Ducks in Mud) when he turneth up, and diveth among heaps of Duſt. Nay, ſo far probably is his Food from being corrupted, or fouled by the terrene particles, that it is perhaps better prepared, by thus being in the Duſt. Before in a Maſs, in the body, it was more ſolid, and required the trouble of being gnawed out and maſticated, but being thus in Powder, it is ready ſubtilized fit for deglutition. And although Duſt to us ſeems to be nothing but Dirt pulverized, or if conſiſting of ſuch Particles alſo as I have ſaid, yet to be ſo blended and mixed with Dirt, as to be inſeparable. But yet it is otherwiſe with our Inſect. I have ſeen them through a Microſcope ſelect the particles of Duſt, and eat ſome and reject many others: Which they can eaſily do, being ſmall themſelves, and having accurate Organs of Sight, Smelling and Feeling, as well accommodated to Duſt, as the Organs of Ducks and Hogs are to find their Food in Dirt.

I cannot forbear here to note a common error about the food of ſuch Creatures, as have been, or are thought to live upon things ſcarce nutritive of themſelves. Thus the *Chamæleon* was thought to live upon the Air, when Flies are eaten by him: Fiſhes to live upon Water, or at leaſt to ſatisfy a perpetual thirſt therewith; whereas their ſucking Water is breathing, and their Food as little of Water perhaps, as other Creatures uſe. So *Earth-Worms* doubtleſs eat Earth, but in all probability it is Earth made of rotted Roots, Plants, or ſuch nutritive things, not pure Earth. Nay, ſo neceſſary is good ſubſtantial Food to all Animals on this our Earth, that I am of opinion (from I think very good

Reaſon) that there is no Animal but what hath its proper Food, even the moſt minute Inſects whatſoever, and that alſo none of the four Elements, although therewith mixed*.

* *v. Ray's Wiſdom of God. p.* 431.

Of Inſects in Spain *by Dr.* Breynius. *com. by Mr.* Petiver. *n.* 301 *p* 2051.

Plate 20. *Tab.* 1.

XXVIII. Tabulæ primæ Fig. 1. Locuſtam exhibet, quæ an deſcripta ſit, necne ignoro, certe mihi videbatur rariſſima. Coloris erat viridis elegantiſſimi, figuræ verò & magnitudinis, quæ in figura exprimuntur. Tardè ſeſe movebat alis deſtituta, quarum locum in tergo, immediate ſub clypeo duæ parvulæ, rotundiuſculæ, luteſcentes occupabant membranulæ. Caput antennis ornabatur longiſſimis, & articulatis viridibuſque pariter. Unicam ſaltem videbam Oleandro inſidentem.

Figurâ 2 adumbratur Inſectum, quod ab Aldrovando in Hiſt. Inſect. L. 4. T. 5. f. 2. & 3. nomine Bruchi inſolentis figuræ depingitur deſcribiturque; ſed deſcriptio ejus manca eſt & Icon minime accurata. Caput huic meo Inſecto erat oblongum, ſuperne criſtatum, & duabus breviſſimis antennis anterius donatum. Corpus & Crura tenuiſſima, cauda vero latiuſcula, articulata, circumflexa ac in ambitu crenata, ſimili eminentia per medium excurrente. Quieſcens Corpus cum binis anterioribus cruribus complicatis erectum tenebat, progreſſum vero ijs quoque ad ambulandum utebatur, quæ nihilominus pro arripiendo victu forcipum inſtar primariò mihi videbantur fabrefacta. Color totius ex cinereo erat luteolus, maculis fuſco-nigricantibus interſperſis. Unicum duntaxat reperi inter gramina, quod poſtmodum per decem dies abſque ullo alimento ſervavi ſuperſtes, donec tandem fatali vitæ ejus filum abrumperem acu.

Figura 3. Inſectum exhibet, quod Moufettus & Jonſtonus nomine Mantes deſcribunt & delineant. Ad quod genus meo judicio pertinent ex Aldrovando l. c. T. 1. f. 1. & 2. & T. 3. f. 10. ex Jonſtono T. 13. f. 18. 21. 22. & præterea omnia Folia ambulantia dicta ex Indiis delata, quæ minime Vegetabilium folia in ejuſmodi Animalcula transformata, uti ſomniarunt nonnulli, ſed Inſecta Inſectorum modo producta eſſe, omnibus facilè rem accuratius examinantibus, nec tam faciles auros prodigioſis fabuloſiſque relationibus præbentibus patebit, opinor. Meum itaque hoc Inſectum eandem exacte figuram habebat & magnitudinem, quæ in fig. 3. videntur. Quatuor inſtructum erat alis, quarum duæ ſuperiores venoſæ aridorum foliorum texturam habebant & ſimilitudinem (hæc magis conſpicua in Indicis ſpeciebus, unde fabulæ origo) coloris ex flavo fuſci; inferiores vero dictis majores quidem, ſed ſubtiliores, neo ita venoſæ, flavicantes, nigris maculis aſperſæ: Ita ut ſuperiores quodammodo thecarum vices gerere viderentur, ut in Scarabæorum genere obſervamus. Præterea notanda extremitas ventris bifurca, anteriora crura craſſiora, ſerrata, uti in Inſecto antecedente, quæ etiam ad eundem uſum a naturâ inſtituta. Corpus reliquum colore erat ex fuſco luteum.

Cum binorum ultimorum Inſectorum figuras Clariſſ. Valliſnerio

forte

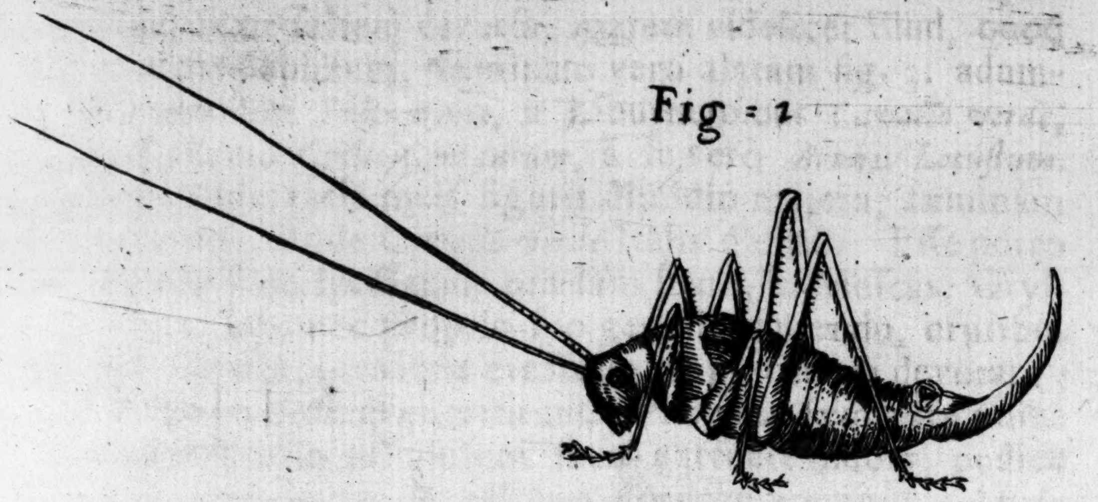
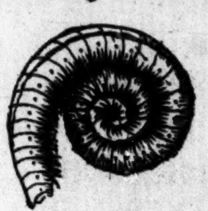


Fig : 1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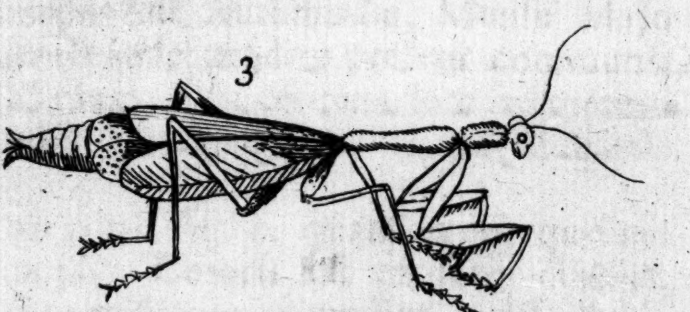
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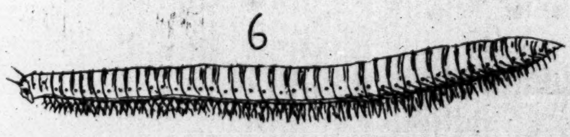
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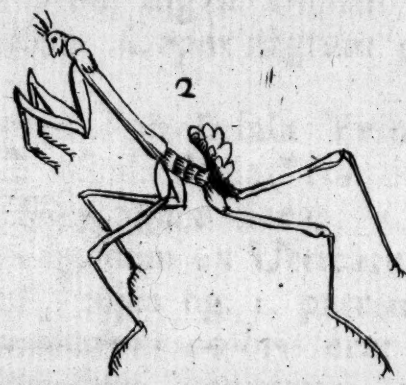
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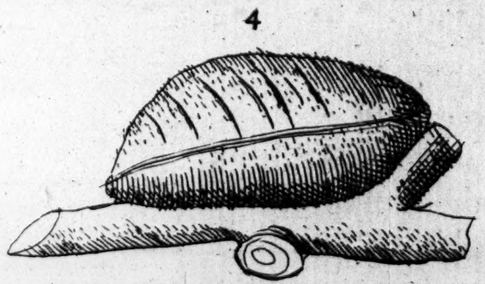
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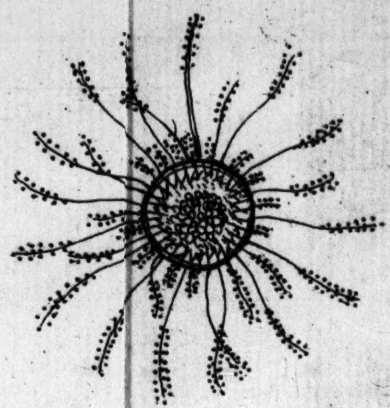
Plate XX. Part III. P. 396.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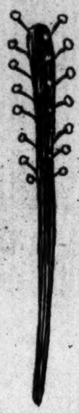
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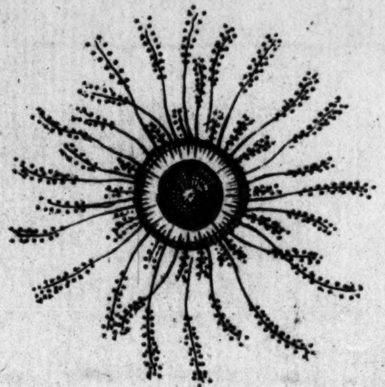
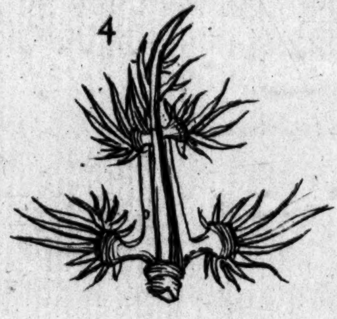


Fig : 1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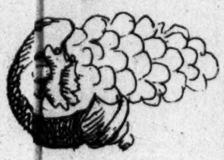
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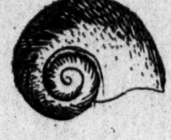
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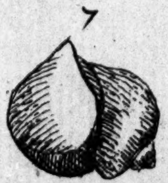
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ſorte fortuna oſtenderem, ipſi, mox ex annotationum ſuarum Theſauro ſequentia de iiſdem mecum communicare placuit. Scilicet ab ipſo etiam eſſe reperta in Italia in Scandianis nempe Regii & Coneglanis Collibus, ſibi quoque miſſa ab amicis ex Marca Anconitanâ, Maurata, Liburno & Florentia; ſe tandem eadem ſoviſſe in ſuo horto. Eſſe ejuſdem generis Inſecta, ſexu ſaltem diverſa, marem videlicet illud, quod alis caret Fig. 2. a me depictum, fæminam vero alatam fig. 3. adumbratam. Ab Hiſpanis dici *Saltamonte*, a Liburnenſibus *Cavallo verde*, ab amico ſuo D. Ceſtono *Grillo-Centaurum*, a ſe verò *Araneo-Locuſtum*. Se eadem aliquando obſervaſſe meis figuris dimidio majora, fæminam ſæpius coloris vireſcentis, unde *Cavallo verde* Italis dicitur. Eſſe porro carnivorum & jucundo ſane ſpectaculo prædam ſuam, ut Muſcas, Gryllos, Locuſtas minores, imo nec proprio ſuo generi parcendo, cruribus anterioribus venari, capere, brevique erectum, ut plurimum devorare; non leve ferociæ & Tyrannidis argumentum. Præterea fæminam unius noctis ſeu 8. horarum ſpatio celluloſum ſuum extruere nidum, podice elevata totum opus perficiente, & reliquo corpore immoto. Antequam verò generationi aptæ ſint, fæmellas biennium attigiſſe opus eſſe obſervavit, tumque primum ſuum elaborare nidum nucis avellanæ magnitudine, qui anno ſubſequente nucem ſuperat & tertio tandem binas adæquat. Nidificationis tempus eſſe Autumnum, Menſe Majo verò vel Junio anni proximè ſequentis inde prodire prolem communis cum parentibus figuræ, ſed exiliſſimam, quæ centenarium numerum plerumque, ſubinde verò duplicatum, pro magnitudine nidi & matris ætate provectiori, attingit.

Nidi ipſius figuram ante oculos ponit fig. 4. quam ex eo, quo me jam nominatus Vir donavit, deſumpſi. Coloris eſt ex luteo cinerei, videturque compoſitum ex humore lenteſcente ex podice emiſſo & indurato. Ruſticis vulgo *Cicala ſecca* dicitur, qui eundem mortuam aridamque credunt cicadam.

Fig. 5. & 6. repreſentat Iulum, qui admodum erat frequens in terrâ ſub plantarum foliis. Colore gaudebat albo, nigris annulis atroque inter annulum & annulum puncto diſtincto. Caput nigrum quemadmodum & pedes.

Marine Animals
Tab. 2.

Animalcula tria marina, quæ non procul ab Inſula Yvicâ Maris Mediterranei, Menſe Auguſto, à Nautâ quodam Mari tranquillo innatantia reperta ad me deferebantur, ſubjungere liceat. Omnia in Tabula ſecunda delineantur. Et primum quidem ex Urticarum marinarum ab Auctoribus dictarum genere eſt, cujus fig. 1. partem adumbrat ſuperiorem; ejus limbus nonnihil concavus coloris erat cœrulei amœniſſimi, medium verò orbis aliquantulum convexum, ſtriiſque circularibus ac radialibus ornatum, coloris argentei. Radiorum inſtar eminentes Appendices à ſupina parte ortæ, quas ſatis celeriter remorum inſtar ſurſum & deorſum movebat, erant dilutæ cœruleæ & fermè diaphanæ, quarum extremitatibus minutiſſimi adhærebant ſubtiliſſimis ſuffulti pedunculis globuli ex nigro cœrulei. Hæ autem Appendices leviſſimâ abradebantur Minervâ, ut totum adeo animalculum utpote valde molle & mucoſum deſtrueretur.

Fig. 2. Exhibet ejuſdem partem ſupinam, quæ præter Appendices jamjam deſcriptas, filamentis duorum generum exornabatur; primum genus circa marginem poſitum brevibus teretibuſque conſtabat filamentis dilutè cœruleis & glabris; alterum verò centrum occupans breviſſima quidem habebat, aſt circa extremum orificioquodam hiantia, colore albo. Hiſce animal dubio procul aliis corporibus adhæret capitque alimentum.

Fig. 3. Hujus demonſtrat Appendicem Microſcopio viſam. Cæteræ figuræ omnes naturalem habent ſuam magnitudinem.

Secundum quod miri Hirudinis marini ſpecies & quidem lepidiſſima videtur. Fig. 4. exponit ejus ſcilicet tergum, quod nonnihil planum, ſtriâ in medio argenteâ longitudinali elegantiſſimè pictum, lateralibus lineis obſcurè cœruleis; cujus coloris quoque erant pinnæ argenteo intermixto, quas natando celeriter movebat. Latera colore gaudebant dilutè cœruleo, prona vero pars ſeu venter albo. Capitulum ei erat oblongum duplici barbulâ biniſque oculis inſtructum; os rotundum parvulum, quo variis ſe rebus, ſuctione ut puto, affigere ſolet. In latere ſiniſtro foraminulum conſpiciebatur, quod pro ano habebam. Hujus ſpeciei duo vel tria vidi Animalcula, quæ in vitro aquâ pleno paucas intra horas expirabant; dumque in Vini ſpiritu ſervare tentabam, mox ſummopere contrahebantur, colore cœruleo in luteo ferrugineum mutato.

Agmen denique claudat Cochlea (Fig. 5, 6, 7.) quædam colore, quam figurâ, ſpecioſior, rariorque; cœruleo enim tincta erat ſaturo, aliquantulum, quamvis parum admodum ad roſeum quoque vergente. Cæterum erat tenuiſſima, lubrica, ſubtilis; animalculum abſcondens Fig. 5. expreſſum quod humorem fundebat ejuſdem cum teſtâ coloris; ipſi adhærebat firmiter aliquid ad inſtar ſpumæ viſcidæ, qua mediante aquæ innatabat ſuperficiei. Et hæc Cochlea marina ob colorem ſuum cœruleum adeo rara eſt, ut nullam huic ſimilem vel deſcriptam, vel in Cimeliis repoſitam me obſervaſſe meminerim.

XXIX. *Papers of leſs general Uſe, omitted.*

1. Some Obſervations concerning Inſects, made by Mr. *John Baniſter* in *Virginia*, *Anno* 1680. with Remarks by Mr. *Petiver.*	*n.* 270. *p.*807.
2. Some Animals ſent from the *Philippine* Iſles, by *F. Camelli*, to Mr. *Petiver.*	*n.* 277. *p.* 1065.
3. Obſervations on the Birds in the *Philippine* Iſles, by *F. Camelli.*	*n.* 285. *p.* 1394.
4. Some Animals ſent from *Carolina*, to Mr. *Petiver.*	*n.* 299 *p.* 1952.
5. Fiſhes from the *Philippine* Iſlands, by *F. Camelli.*	*n.* 302. *p.* 2043.
6. De Serpentibus *Philippenſibus*, by the ſame.	*n.* 307. *p.* 2271.
7. De Quadrupedibus *Philippenſibus*, by the ſame.	*n.* 305. *p.* 2297.
8. De variis Animalibus *Philippenſibus*, by the ſame.	*n.* 318. *p.* 241.
9. De Araneis & Scarabæis *Philippenſibus*, by the ſame.	*n.* 331. *p.* 310.
10. Some Quæries concerning the Migration of Birds, by Mr. *Derham.*	*n.* 315. *p.* 123.
11. Oſteographia Elephantina: Or, A full and exact Deſcription of all the Bones of an Elephant, which dy'd near *Dundee*, *April* the 27th, 1706. with their ſeveral Dimenſions. To which are premis'd, 1. An Hiſtorical Account of the Natural Endowments, and ſeveral wonderful Performances of Elephants, with the manner of Taking and Taming them. 2. A ſhort Anatomical Account of its Parts. And added, 1. An Account of the Weight of all the Bones in this Subject. 2. The Method I us'd in preparing the Sceleton. 3. Four large Copper Plates, wherein are repreſented the Figures of the Stuff'd Skin, and prepared Sceleton, as they now ſtand in the Publick Hall of Rarities at *Dundee*; with the ſeparated Bones in ſeveral Views, and other Parts of this Elephant. Communicated in a Letter to Dr. *Hans Sloane*, R. S. Secr. by Mr. *Patrick Blair*, Surgeon, *&c.*	*n.* 326. *and* *n.* 327.

This Relation being printed verbatim *in a Pamphlet by it ſelf, and eaſie to be purchas'd, I thought proper to omit it: though it be very well worthy the Peruſal of the Curious.*

THE

XXIX Papers of this general Class, omitted.

Some Observations concerning Insects, made by Mr. [illegible]
[illegible], with Remarks by Mr. Petiver.

Some Animals sent from the Philippine Isles, by F. Camelli, [illegible]

Observations on the Birds in the Philippine Isles, by F. Camelli. [illegible]

Some Animals sent from Carolina, to Mr. Petiver.

Fishes from the Philippine Islands, by F. Camelli.

De Serpentibus Philippensibus, by the same.

De Quadrupedibus Philippensibus, by the same.

De variis Animalibus Philippensibus, by the same.

De Araneis et Scarabæis Philippensibus, by the same.

Some Queries concerning the Migration of Birds, by Mr. [illegible]

Osteographia Elephantina: Or, A full and exact Description of all the Bones of an Elephant, which died near Dundee, April the [illegible], with their several Dimensions. To which are premised, [illegible] Historical Account of the Natural Endowments, and [illegible] Performances of Elephants, with the manner of taking and taming them. 2. A short Anatomical Account of [illegible] 3. An Account of the Weight of all the Bones of this [illegible] The Method used in preparing the Skeleton. [illegible] Large Copper Plates, wherein are represented the Figures of the Skull and Skin, and intire Skeleton, as they now stand in the Publick Hall [illegible]; with the separated Bones in several Views, [illegible] Parts of this Elephant. Communicated in a Letter to Sir Hans Sloane, [illegible] Sec. by Mr. Patrick Blair, Surgeon, &c.

[illegible] thought proper to omit it, though it be very well worthy the Perusal of the Curious.

THE
Philoſophical Tranſactions
From the Year 1700. to 1720.
Abridg'd and Methodically Digeſted.

PART IV.
The *Philological* and *Miſcellaneous* Papers.

CHAP. I.
Chronology, Hiſtory, Antiquities.

I. *Of the Age of* MSS. *&c. in a Letter to a moſt Rev. Prelate, by Mr.* Wanley, *n.* 300. *p.* 1993.

THE ſubſtance of what your Grace is pleas'd to ſay about Manuſcripts and Copied Writings (as I apprehend it) is, 'that 'tis not only poſſible, but very eaſie, 'upon the peruſal of a written Book, to pronounce 'in what Age or Century it was written, ſuppoſing 'a Man to be tolerably well vers'd in Books of that 'Language or Country. And that this judgment 'may be made, only by obſerving the Shape and Figure of the Letters of the Book, which (as all other things) have their 'fix'd Periods for their Duration: as being form'd this way in ſuch a 'Century, and ſuch a way in the next; Time only (which alters the outward ſtate of other things) working this Change in Letters alſo, of what 'Age, Language, or Country ſoever they be.' And then as to Original Compoſitions, your Grace is of Opinion, 'That the Style and Diction of 'any noted Author being well obſerv'd, 'tis very eaſie to diſcover ſuch o-

‘ thers of his Works as have gone abroad without his name; and alſo the ‘ very time when the Author liv'd.

'Tis evident, my Lord, that a Man may judge of ſome MSS. by the Hand; and of the Genuine and Spurious Works of ſome Authors; and of the time likewiſe, wherein they liv'd, by the Style of them; but whether this be ſo eaſie a Work, and that the Rules Men generally go by in theſe caſes, are always infallible Guides, is what (I own) I very much doubt of. Suppoſe, my Lord, for inſtance, a Man ſhould bring to any Antiquary a good MS. Copy of the *Hebrew* Bible, *Pentateuch*, or *Pſalter*, written in a ſmall common Letter, without Points, without fine Knots, and Flouriſhes, without Pictures, and great Letters, or any thing that ſhould look like Pompous: Suppoſe that the Ink, Parchment, *&c.* ſhould carry a ſeeming face of Antiquity with them, and that a Man ſhould ſay his MS. was 1000, 1200, or 1300 years old, when as really it was written within a very few Years: Could he from the Hand alone ſoon find out the Cheat?

All the *Hebrew* MSS. that I have as yet ſeen, are written either with *Samaritan* or *Chaldee* Letters. As to the *Samaritan*, I own they bear a good reſemblance one to another, and that they differ very much from thoſe *Samaritan* Characters, which we find ſtamped upon divers truly Antient and Genuine *Coins*. But then there ſeems to be ſuch a Reſemblance (as to the Character) between thoſe Coins ſtruck in Ages far diſtant from one another, that 'tis hard (from the Conſideration of the *Metal*, its *Fabrick*, *Weight*, from the Shapes of the Letters in the Inſcription, *&c.*) to ſay which Coin was made in the time of *David*, or *Solomon*, and which no older than the time of the *Maccabees*; this being rather to be gathered from the Words and Meanings of their Inſcriptions, than from the Figure of the Characters which compoſe them. The ſame may be ſaid, in a great meaſure, of the old *Greek*, *Punic*, *Roman*, *Britiſh* and other Coins. The *Chaldee* Character has indeed varied in tract of time, according to the different Fancies and Humours of Men. The *Even plain* Letter, I think, is the moſt Ancient. This they altered into a more neat way of making it, as your Grace finds in *R. Stephens*'s *Hebrew* Bibles. There is a third faſhion, of waving the perpendicular ſtrokes like Rays, as your Grace remembers in ſome of the *Hebrew Coins* exhibited in the *Prolegomena* to the *Polyglott* Bibles. Then fourthly, there is a large fat Letter in the MS *Rituals* and *Liturgies*, beſides the *Rabbinical Letters* of *Italy* and *Germany*, with their Offſpring; the *Littera Coronata*; and perhaps others that I never ſaw: (not to mention here the *Jewiſh* Cuſtom of writing the Vulgar Language of the Country wherein they live, with *Hebrew* Letters.) It ſeems a hard matter, my Lord, to trace the Original and Progreſs of all theſe ways of Writing, ſo, as upon the bare ſight of a *MS.* written in the *Hebrew* Language or Character, to ſay, *by the ſhape of the Letters of this Book it appears to be ſo old*: and it ſeems much more difficult to aſſign the particular *Province* or *Country* wherein each *Hebrew* Book was written, as for example, in *Italy*, *France*, *Spain*, *Portugal*, *England*, *Holland*, *Germany*, *Poland*, *Barbary*, *Perſia*, *India*, in the ſeveral Provinces of *Turkey*, *&c.*

The ſame almoſt may be ſaid of the *Greek Manuſcripts*, in which Language there has been a great diverſity of Writing, according to the different humours of the *Scribes*, the Faſhion then in uſe, or the Manner of that particular *Province*, in which ſuch a Book was written. Nor is it eaſie (tho one would be apt to take ſuch Differences for Land-marks) to tell the Age of a *Greek* MS. without the Date; and I never yet ſaw ſuch a Date ſo high as the Year 640, according to the *Greek* Computation. And it is ſtill much harder, from any Remarks about the Character, Illumination, Ink, Parchment, Paper, Binding, *&c.* to find out what [*] Country, Province, or Iſland, ſuch a *Greek* Book ſhould be written in, or what Country-man the [†] *Scribe* ſhou'd be. Nay, and what does farther add to the Difficulty, is, that 'tis known that the ſhapes of the *Majuſcule* Letters found in *Greek* MSS. have been retain'd for above 600 Years together, with little Variation; and alſo, that ſome MSS. written with *Minuſcules* and with Accents, are older than ſome others which want them. And alſo, that the preſent *Greek Copiſtes* or *Librarii* have three or four different Hands commonly uſed by them, one being their own *Common Hand*, the others an Imitation of old MSS. which are more beautiful, but troubleſome in writing, than their ordinary Running Hands: It being cuſtomary, as I have been told, when a Man wants a Copy of ſuch a Book to be written, for the *Copiſte* to ask in what Hand it muſt be written (for one Hand, it may be, is more coſtly than another;) and according as they agree, the Book is written. And thus I have ſeen ſome very new Things written in the ſame Hand with Books which are certainly 400 Years old.

What Methods Learned Men have taken, in order to inform themſelves of the different Ages of MSS. I know not: but my own has been this; I have been careful to get all the *Dates* I could, wherein 'twas ſaid that ſuch an individual MS. was written, at *ſuch a time*, or by *ſuch a particular Perſon*; every Book with a *Date*, being as a *Standard* whereby to know the Age of thoſe Books of the *ſame* or a *like* Hand, and of thoſe that are not very much *older* or *newer*. Where Dates have been wanting in ſome Books, perhaps they have had ſome Succeſſion of *Emperors*, *Kings*, *Popes*, *Biſhops*, or other *Officers*; and ſetting down the continuance of their Predeceſſors for ſo many Years, Months, and Days, if there be only the naked Name of him who is the laſt in order, (all other Circumſtances concurring,) I then judge the Book to have been written during the Life or Reign of ſuch a Perſon. Eſpecially if that Succeſſion be afterwards continu'd by a more recent Hand, or that there be two Succeſſions, as of *Kings* and *Biſhops*, and the laſt of each happen to be Cotemporaries. Other Obſervations I have made from *Hiſtorical Notes* and *Eccleſiaſtical Tables*, in ſome Books. At other times I light upon ſome *Authentic Charter* or *Original Writing*, in the ſame Hand with ſuch a Book as I have remembred to have formerly ſeen, but without any gueſs at the Age of it. The Age of the *Charter* being known, that of the *Book* is then known alſo: for I never entertain'd any Notion, or relied upon any Obſervation, but as I found it confirm'd by the Suffrage of concurring Circumſtances, and ſufficient Authority. But even in *Dates*, I have found that a Man ought to be very Cautious; for ſome have been altered by later Hands, for corrupt and baſe Ends. Some are ſo worded, as when one thinks that the time they mention, is the time when the MS. was finiſh'd by the *Copiſt*, or *Book-writer*; it is meant only as to the time when the Author finiſh'd his Compoſition. Other Books are *Poſt-dated* that they might be accounted New. Of this laſt kind, is a *Greek* MS. I ſaw in the Univerſity Library at *Cambridge*, which, as appears by a written Annotation therein, was bought ſuch a Year at *Rome*, for ſo much; and yet the Date pretends that the Book was written at *Rome* in ſuch a Year, which happens to be two Years after it was bought and paid for. The Reaſon of theſe *Poſt-Dates* was, becauſe, before Printing came up, a Book was by how much the Newer, by ſo much the more Valuable. An *old Book* might be bought for an *old Song*, (as we ſay) but he that tranſcribed a freſh Copy muſt be paid for his pains. And therefore, I have found in ſome Catalogues of the MSS. formerly extant in our *Abbey-Libraries*, that when they ſaid ſuch a Book was *Liber Vetus*, they would often add, *& inutilis*; but *Liber Novus* was *Nitidus*, *eleganter ſcriptus*, *lectu facilis*, *&c.* which mean Opinion of the Ancient Copies, by the way, may have been the Occaſion of the Loſs of many a good Author. The *Librarii* or *Book-writers* were from the time of the *Romans*, a particular Company of Men, and their Buſineſs a Trade: But tho *Book-writing* was their Profeſſion, yet they afterwards had but a third part of the Buſineſs.

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[*] If a Man is born in one Country, and writes a Book in another, keeping ſtill to the *Character and manner of Writing* uſed in his own Country, I look upon it as the ſame thing as if he wrote it at home. And therefore I look upon the *Greek* MSS. which *Angelus Borgecius* wrote at *Paris*, as if they were written in *Candy*, where he was Born. And ſo (amongſt many others) to inſtance in a *Latin* MS. I look upon a Copy of Pope *Gregory*'s Paſtoral Care, (now remaining in the *Bodleian* Library) as a noble Monument of our *Saxon* Anceſtors: Tho St. *Willibald* wrote it, perhaps, at *Mount Caſſinum* in *Italy*, and afterward (as it is probable) carried it with him into *Germany*, where it remain'd at *Wurtzburgh*, till that City was plunder'd by the *Swedes* about 70 Years ago.

[†] Now this may in ſome meaſure be done by *Latin* MSS. becauſe there are greater plenty of them. For even I, by exactly obſerving the nature of the Characters, *&c.* of thoſe MSS. whoſe Country I was ſure of, have afterwards been enabled to ſay, that this *Book looks as if it had been written in* France, Italy, Spain, Germany, *the* Netherlands, England, Ireland, &c. *and*, it may be, *about ſuch a time.*

Learning (after the Erection of Monaſteries,) was chiefly in the hands of the *Clergy*; who were for the moſt part *Regulars*, and liv'd in Monaſteries. Amongſt theſe were always many induſtrious Men, who wrote continually new Copies of old Books, for their own uſe, or for the Monaſtery, or for both; which ſeems to have ſwallowed up above half the Buſineſs. Then, if an extraordinary Book was to be written, for the *ſtanding, and more particular Uſe* of the Church or Monaſtery, the *Anti-*

quarius muſt be ſent for, to write it in large Characters, after the old manner, and ſuch a Copy they knew would laſt for many Ages, without Renovation. Between theſe two ſorts of People, the *Writing-Monks* and *Antiquarii*; the poor *Librarii* or common *Scriptores* (who had Families to maintain) could hardly earn their Bread. This put them upon a quicker way of diſpatch, that ſo they might underſell one another: And in order to this Diſpatch, they would imploy ſeveral Perſons, at one time, in writing the ſame Book, (each Perſon, except him who wrote the firſt Skin, beginning where his Fellow was to leave off:) Or elſe, they would form the Letters *ſmaller and leaner*, and make uſe of more *Jugations* and *Abbreviations* than uſually others did. And this, my Lord, is the only account that I can give, for that *Variety* of Hands which in former Ages, being learn'd of, or borrow'd from the *Romans*, was commonly us'd, and in faſhion at the ſame time, and in the ſame Country, (throughout theſe Weſtern Parts of *Europe*,) and for their growing leſs and leſs for one Age after another. An inſtance of this may be given from the *Hands* of *England*, which about the Year of our Lord 730 was of three ſorts.

I. The *Roman Capitals*, ſtill retain'd, and kept up by the *Antiquarii*, in ſome Books and Charters.

II. The more *Sett Saxon Letters* (which have a near affinity with the *more Antient Iriſh Characters*, as being with them derived from the *Roman*,) which were uſed as the Common Hand of the Age, by the Monks in their *Books*, and ſome *Charters* of their Dictating and Writing.

III. The *Running Saxon Letters*, fuller of Abbreviations, and ſomething of kin to the *Longbardic* and *Franco-Gallic*, (both which, with this third ſort, were alſo of *Roman* Original,) and was uſed by theſe *Librarii* in their Books, and in the Charters; as alſo by ſome Authors who wrote much, as *Bede*, &c.

There was another ſort of *Book-writers* ſtill in uſe, namely, the *Notarii*, whoſe buſineſs it was to take *Tryals* and *Pleadings* at Courts of Judicature; to write as *Amanuenſes* from the Mouth of an Author; and to take *Homilies* and *Sermons* at Church, from the Mouth of the Preacher. Theſe *Notarii* made uſe of *Notæ* or *Marks* inſtead of Letters: But when, in Proceſs of Time, Letters were uſually written ſmall and quick, and Abbreviations grew Common, the *Notarii* were turn'd off, unleſs they would write Books in *Long-Hand*, as other *Librarii* did, and their *Notæ* grew out of uſe; and moſt of their Performances in *Notes* or *Marks* have been ſince deſtroy'd.

Suppoſe then, my Lord, that a Man had one *Latin* Book of each of the four ſorts above-mentioned laid before him, written all at a time, and without any *Date* or Note of the Age: Would not he be ready to ſay that the three firſt were older than one another? As that that in *Capitals* was older than that in the *Midling* Hand; and this again older than that in the *Running* and *ſmaller* Hand? and that ſuch a Book written in the *Notæ* being all full of marks, was not *Latin*, but of ſome other unknown

Language? But to come down later; Suppoſe that a Perſon ſhould have ſome recenter *Books* or *Charters* laid before him in the *Pipe*, *Text*, *Exchequer*, *Chancery*, *Court*, and *Common Hands*, all written at the ſame time; would not he be apt to ſay, that one ſeem'd to be older than another, and that they were the Hands of ſeveral Nations?

If it be difficult for an Inquiſitive Perſon to be a perfect Maſter in all the Succeſſions of Hands, that have been us'd in his own Country, ſo far as he may be guided by the Monuments therein extant, (and I never heard of any Man that was ſuch a Maſter) ſurely, it muſt be more difficult to pronounce the Age of thoſe Books, *from the Hand*, which were written in other Countries, in an unknown Language. And what may make a Man yet more liable to miſtakes (beſides the want of Dates in the moſt Antient *Greek*, *Latin*, and other MSS) was the Practice of many Writers, ſtill to uſe the very ſame Hand when in Years, as they learnt when they were Young; like as many Antient People, who do yet continue to write the *Roman* and *Secretary Hands*, which were more faſhionable 50 or 60 Years ago, than now.

I will now (with your Grace's leave) touch upon the next Head in your Graces Learned Eſſay, ſhewing the great *Eaſineſs* of finding out an Author, and the Time he liv'd in, by his *Style* and *Phraſe*.

I wiſh, my Lord, that it was as eaſie to diſcover the *Villanous Authors* of ſome Treaſonable and Scandalous Libels, by their *Style*, as it has been to find out the *Printers*, by the *Paper* and *Letter*. Could this be done, it might not be unuſeful to the Government. But People have learnt the knack of changing their Style, upon Occaſion, ſo Artificially, as not to be diſcovered, but when they themſelves are willing to be known. Who would have thought that *Eraſmus* wrote the *Epiſtolæ obſcurorum Virorum*? Or that ſome of the nicer, nay, the moſt eminent Modern Criticks could have been impos'd upon by their familiar and near Acquaintance, who trump'd upon them their own recent Performances for invaluable fragments of the Antients, whoſe other Works theſe very Critics had lying before them? It has been a frequent Practice in all Ages for poor Scriblers to father their wretched Offspring upon Illuſtrious Perſons: and the diſparity between the Genuine works of the one, and the Spurious pieces of the other being evident enough, it has been eaſie to diſtinguiſh between the Gold and the Braſs. But, my Lord, I would humbly ask this Queſtion, is all that is even now by learned Men aſcribed to ſome Antient Voluminous *Greek* and *Latin* Authors, undoubtedly theirs? May not there ſtill ſome ſuppoſititious Pieces lurk among them, which have the luck to be receiv'd, only becauſe they have been more ingeniouſly counterfeited? Nay, may not the ſame Perſon in the courſe of his Life, even alter and vary his Style and Phraſe unwittingly, and without any deſign to do ſo? I think Mr. *Richardſon* ſomewhere in his Anſwer to *Amyntor*, upon occaſion of the difference in point of Style between the *Revelation* of St. *John* and his *other Works*, between the *Prophecy* of *Jeremiah* and his *Lamentations*, does tell us from Dr. *Cave*, that the conſideration of the Times when a Man writes, or of the Perſons to whom, or the Subjects about which, or the Temper of Body, or the Humour he is in when he Writes, or the Care and Pains that he takes in Writing, may Occaſion ſuch Alterations in his Style, as that no certain Rule can be inferr'd from thence. And if my Lord, it was really poſſible to find out the Time when an Author liv'd, only by diligent Reading his Works, ſurely the World wou'd have been long ſince agreed as to the Time when *Homer* lived, though they could not tell where he was born. And I believe even in the Liſt of *Eccleſiaſtical Writers* there are ſome, and thoſe not of the leaſt conſideration, who (notwithſtanding their Works have been read over and over) are ſtill reckon'd to be of uncertain Age.

As for *Pictures*, though I have much leſs Experience in them, than I had once in MSS. yet I will not deny but that the Works of an hundred Maſters (beſides thoſe your Grace has been pleas'd to mention) may be known by the Hands, tho they may be almoſt as different as their ſeveral Hands in Writing: But that one Painter can't Copy from another ſo exactly, as that in tract of time it ſhall not be known which Picture is the Original, is what I dare not aſſert. It has been frequently practis'd by Painters to borrow Pictures of thoſe who are Lovers and Judges of ſuch things, to Copy them, and to return their Copies for the Originals, without any diſcovery made by the diſcerning Owners. And I believe it poſſible (tho exceeding difficult) for a great Maſter to Copy a Picture ſo, that when they both ſtand together, a good Judge ſhall not dare poſitively to ſay which is the Copy, and which not: Nor he that drew the Original, dare to own, that he could imitate his own Handywork better than a Stranger has done. There are a great many Stories common among Painters, to this purpoſe. And one wou'd not think it much more difficult, for a Man to imitate a Drawing or Picture, than to counterfeit another Man's Hand-writing, which ſome People can do moſt exactly. And others with Pen and Ink, will Copy after any thing that is Printed ſo nicely, as that one would affirm their Writing to be printed off at the Preſs.

Your Grace's Notion of diſcerning the *Age*, as well as the *Hand* of the Painter, by his Picture, is very curious, and altogether new to me: And I doubt not but there is a great deal in it. I only want the whole Works of ſome great Painter, with an account of the time when he wrought each Piece, to fit me for the making the Experiment. And why might not this Notion be advanc'd a little further, and the Painter's Complexion be known by his Pictures, as well as his Age? as ſuppoſing that the *Sanguine* do naturally run upon *Pourtraits, Poetical Hiſtories, Nudities, &c.* The *Cholerick* upon *Battle-pieces, Sea-fights, Fire-pieces by Land or Sea, Tempeſts, &c.* The *Phlegmatick* upon the *Still-life, Flower-pieces, Birds, Beaſts, Fiſhes, &c.* and the *Melancholie* upon *Landskips, Architecture, Pieces of Perſpective, &c.* Not but that the different Genius of a

Country, or the Deſires of a good Cuſtomer, may oblige a Painter to work upon a ſubject, which he had no great Fancy for. As to the difference in the works of Painters grown old, in reſpect of what they did when young, I doubt no certain Rules can be eſtabliſh'd as to their Performances in that kind. I know, my Lord, that Painters do generally live faſter than other Men, which may at length occaſion a failure in their Sight and Memory, a trepidation in their Hands, *&c.* And yet I never heard that *Michael Angelo, Alb. Durer, Titian,* and others, painted worſe at the latter end of their long lives, than they did before. Nay, I hear that *Signior Verrio,* tho grown old, paints now far better than ever, and is grown almoſt aſham'd of ſome of his own Works which he painted at *Windſor Caſtle* in the time of K. *Charles* II. There may be this in it, that aged Perſons having attain'd, thro long Practice, to a greater Experience, to a more Solid and Mature Judgment than they had when younger, are more cautious of that which they let go out of their Hands; and correct thoſe flaſhy touches of their Pencil, and other ſuperfluous Irregularities, which they and others were formerly very fond of.

As for the *Flame and motion of the Eyes* in a Picture, or the *Breath in the Mouth,* I can ſay but little, having as yet never had the happineſs to ſee ſuch Rarities, tho' I have been admitted to the ſight of ſome of the beſt Pieces of the moſt celebrated Maſters. As to the Painters Painting a Living or Moving thing, ſo that one ſhall almoſt diſcern the Motion, and ſee the *Bird Flying, the Horſe or Hound Running, &c.* that is more eaſie, eſpecially when aſſiſted with the friendly and pregnant Fancy of the charm'd Spectator. In the *Still-life* indeed, the Eye is quickly deceiv'd, and tho' there are, I believe, ſeveral Maſters now living more excellent at it than ever *Zenxis* and *Parrhaſius* were; yet ſtill with all their Art, 'tis very difficult to impoſe upon a Man ſo, as to make him believe 'tis not a *Picture,* but the very *Life* that he ſees before him.

Muſicians ſeem to be under the ſame Predicament with *Painters,* ſince they are obſerv'd to live *Faſt*; as alſo the *Poets.* 'Tis by the Practice of many Years that they attain to a juſt Knowledge and Maſtery in their reſpective Arts; and as their firſt Compoſitions are little and light, ſuitable to the Mercurial temper of heedleſs and inconſtant Youth; So, in time, this wears off, and as their Experience and Judgment encreaſes, their Compoſitions grow more ſolid and ſound. A young Man may make a better *Minuet* or *Jigg,* but the Elder a more ſound *Service* or *Anthem.* The Muſic of the former (with other Accompliſhments) may go a great way towards the enticing a fooliſh Girl to Love; but that of the latter excites the Devotion, moves the Affections, and raiſes the Paſſions of thoſe truly Religious Souls, who take pleaſure in ſinging Praiſes to the Honour and Glory of his Name, who lives for ever and ever.

If your Grace ſhall ſay, *that the very beſt Painters, Muſicians and Poets died young, or at leaſt before they attain'd to an advanc'd Age, when they* *would have fail'd or grown dull, as others did:* I muſt beg leave to ſay that old Men are of two ſorts, either thoſe who are much affected with their Age and weakneſs, or thoſe who are not.

If a Man be born of unſound Parents, or hath liv'd all along in an Air diſagreeable to his Conſtitution, or has his Conſtitution always unhealthful, or has liv'd an intemperate or debauch'd Life, or has been cruſh'd by any heavy Misfortunes, or always liv'd in Poverty or Diſcontent; 'tis no wonder, if in ſpight of all this, he attains to old Age: but then he will probably loſe the clearneſs of his Head, rhe fix'd attention of his Mind, the brightneſs of his Parts, which he might be formerly noted for. If a Man has never had any of theſe diſadvantages to wreſtle with, but has all along been bleſs'd with the contrary: then, he being bred up to a Profeſſion, and always following it, his Judgment therein ſtill encreaſes, and his Hand (one would think) ſhould be more nimble and ready, and the Man a better *Painter*, *Muſician* or *Orator* than ever: And why not a better *Poet* too? I ſay, with ſubmiſſion, my Lord, if Mr. *Dryden* (tho he was ſaid to be unhealthy at laſt) wou'd have taken as much pains, or had been allowed time to his Mind for reviſing his later Poems, as in ſome of his former, they might have been as well, if not better accepted. I don't ſee that 'tis old Age that does a Man this diskindneſs, but rather, that 'tis the Accidents that do often attend it, which yet many are freed from to the very laſt. Suppoſe then, my Lord, if *Raphael* or *Vandyke*, or the late Mr. *H. Purcell*, or *Aleſſandro Stradella*, ſhould have continued their Practice of Painting and Muſic till they grew old, from the Accidents attending which, ſuppoſe them (as a great many other People) to be very free; might we not then have juſtly expected from them even greater Wonders than they had ever before perform'd? I won't ſay that an old General is fitter to be truſted than a young one; or that the late *Mareſchal Scomberg* at his Death, was a better Soldier (notwithſtanding his Age) than the preſent Kings of *Sweden* and *Poland:* But rather, that the Study of *Divinity*, or of the *Laws*, do ſeem as nice and large as thoſe of *Painting* and *Muſic*. Now the old and ſage Men of thoſe Profeſſions are every where moſt regarded, they are found to have the ripeſt Judgments, and they are deſervedly employed in the moſt weighty Affairs appertaining to their Profeſſions. And it has been ſeen (as was partly ſaid before) that ſome *Painters* and *Muſicians* have not at all fail'd as they grew old, but kept that great Reputation to the laſt, which they had before acquir'd. My Lord, upon the whole, it ſeems to me (tho I know my Opinion is of no weight) that there is a gradual and ſenſible alteration in the appearance of things, and eſpecially in the Scripture or Hand-writing of MSS. Now theſe ought to be conſider'd with reſpect to the particular places wherein they were written.

Every Country is ſuppoſed to have remaining in it the greateſt Variety and moſt conſiderable Monuments of its own Characters; unleſs they are known to be carried away to other places. And therefore, if any Man be deſirous of conſidering the Letters of any Language that has been confin'd to any one particular Region or Province; 'tis but going thither, and it's ten to one, but (if he be diligent) he may ſatisfie his Curioſity very well. For Example, ſuppoſe I ſhould be willing to conſider the nature of the *Iriſh Letters*, their Original, Progreſs and Variations, with their Relation to the *Roman, Franco & Anglo-Saxon:* this might be done by travelling *Ireland* principally, by taking a trip into the *Scotch Highlands*, and perhaps into the *Iſle of Man*, and by conſulting ſome *Engliſh* and other Libraries, whither ſome *Iriſh MSS* have been carried. If I wonld conſider the *French*, *Italian*, *Spaniſh*, and *Engliſh Hands*, each Country affords ſufficient helps. But if a Man would conſider the Letters of a dead or living Language, which ſpread far, and has been, or is us'd in ſeveral Countries: he can't be ſuppos'd a perfect Maſter in all the ways of writing that Language, till he has conſider'd the whole State and Succeſſion of its Letters in each of thoſe Countries: Amongſt thoſe Languages I reckon the *Hebrew*, *Arabic*, *Turkiſh*, *Armenian*, *Perſian*, *Greek*, *Latin*, *Teutonic*, *Sclavonian*, *&c.* And tho' *Latin* is common amongſt us, and every body is pronouncing the Age of a *Latin* MS. yet I think they would do well to enquire where as well as when a Book was written. And if they are certain that ſuch a *Latin* Book was written in ſuch a particular Country, or Province, 'tis then more eaſie, by conſidering the Succeſſion of Letters us'd in that Province, or by comparing it with other Books written therein, to ſay how old it is. For want of this conſideration many Learned Perſons have been almoſt always out in their Calculations, and have pronounc'd at Random. If then, my Lord, this Method appears Rational, and even Neceſſary, in order to attain a ſufficient Meaſure of this ſort of Knowledge; it follows, that 'tis no eaſie matter to aſſign the Age even of a *Latin* MS. no, not even in *England*, where yet I ſuppoſe there may be as great a variety of *Latin* Hands, as in moſt other Countries.

As for *Painting* and *Muſic*, they are Arts that I have always had a great Love and Affection for. I know very well that each Painters Hand and each Muſicians Manner differs from another; but whether there is a gradual and remarkable Variation from themſelves in the Courſe of their Lives, is what I never heard aſſerted. This is certain, that they change their way of Painting and Compoſing at pleaſure; and therefore, Mr. *H. Purcell*'s *Dulcibella* is ſaid not to be like his other Muſic; and Mr. *Fuller* the Painter could put one of his Pieces upon Sir *Peter Lely* for a moſt incomparable Picture of *Mich. Angelo*. But then theſe Changes and Variations from their uſual Manners are very ſeldom made. And a Man generally purſues and practices that which is moſt agreeable to his own Genius. For this Reaſon, when a Painters Hand is fixed, his Manner is then limited; and ſo when a curious Perſon comes into a Gallery, he knows that this Picture was done by *Ryley*, *Kneller*, *Vandyke*, *Dobſon*, *Tintoret*, *&c.* and that to be a Copy after *Reubens*, *Georgeon*, *Salv. Roſa*, *Han. Caraccio*, *Pietro di Cortona*, *&c.* When he comes to an *Opera*, to a *Conſort*, or to *Church*, not knowing before-hand what Muſic is to be perform'd, yet he may ſoon diſcern that it was compos'd by *Corelli*, *Baptiſt*, *Baſſani*, *Chariſſimi*, *Blow*, *Purcell*, *&c.* And ſo upon Reading an Antient Author, a ſagacious and learned Perſon may find, that he writes according to the manner of ſuch an Age, that the Style imitates ſuch another, or that the Book, tho' it bears ſuch a Man's Name, yet might, perhaps, be more truly aſcribed to another, with whoſe Style it more exactly agrees: As for Example, that Piece of S. *Cyril*'s, publiſh'd from the *Eſcurial* MS. by *Barthaſar Corderius*, is thought (by reaſon of the Analogy in point of Style) to be *Origen*'s: But then, whether all this can be always done, done eaſily and without *Errors*, is the doubt. And it ſeems yet a greater difficulty, certainly to diſcover how old the *Painter*, *Muſician*, *Poet*, *Orator*, or other *Author* was, when he finiſh'd any one piece of his Works, unleſs a Man is plainly told ſo: This being a ſort of Knowledge, that thoſe who have been otherwiſe ſufficiently experienc'd in their ſeveral Arts and Profeſſions, have not as yet pretended to.

The Rule for finding Eaſter *explain'd, by Mr.* Thornton, n.297. p.1902.

II. 1. Rightly to underſtand the Rule in our Common Prayer Books for finding *Eaſter*. Note,

That *March* 21. in all but Leap-Years, and in Leap-Years *March* 20. was at the time of the Council of *Nice*, when this Rule was made, the Vernal Equinox. Conſequently,

March 20. in Leap-Years is the ſame as *March* 21. in common Years.

The Full Moon meant in this Rule, is not to be found in our Almanacks, but by the Calendar of our Common-Prayer Books, where in the firſt Column the Golden Number of every Year is placed over againſt the Day of the New Moon in every Month of the Year.

The 14*th* Day, including the firſt Day of the Moon, is the Full Moon, and not the 15*th*.

--by Mr. Jackman, *n.* 303. p. 2123.

2. The Rule is thus worded, *viz.*

Eaſter-day *is always the firſt* Sunday *after the firſt full Moon, which happens next after the one and twentieth day of* March. *And if the full Moon happens upon a* Sunday, Eaſter-day *is the* Sunday *after*.

For the right underſtanding of which it is ſufficient to obſerve,

1. That the full Moon meant is the 14*th* Day of the Moon, according to the Calendar in the *Common-Prayer-Book* (which may be called the Church-Calendar) counting that Day of the Month for the firſt of the Moon, which hath the Golden Number of the Year collateral to it in the firſt Column of the ſaid Calendar. And

2. That theſe words [next after *March* 21.] are meant incluſively, as if it had been ſaid [next after the commencement of *March* 21.] ſo that if the Full Moon happens on *March* 21. the ſame muſt be the Paſchal Full Moon.

Theſe Obſervations are neceſſary and ſufficient to reconcile the Rule with the authentick Table to find *Eaſter* (from which Practice never varies) and then they are right and ſufficient.

1. I prove the firſt Obſervation neceſſary to that end: Becauſe, if the Paſchal Full Moon be any Day, before or after the 14*th* of the Moon by the Church-Calendar, then the Rule and the Table will claſh. For 1. If it be any Day before, then as often as the ſaid 14*th* of the Paſchal Moon is a *Sunday*, that very Day, at lateſt, muſt be *Eaſter-day* by the Rule, as being a *Sunday* after the full Moon therein meant: Whereas by the Table and Practice it is not till the *Sunday* after that. Thus *Sunday April* 1. this Year (1705.) was the 14*th* day of the Moon by the Church Calendar, and therefore muſt have been *Eaſter-day* (or after) by the Rule, if the full Moon therein meant had been any Day before the ſaid 14*th* of the Moon, whereas *Eaſter-day* was *April* 8. by the Table, and accordingly obſerv'd. And this obliges us not to underſtand the true full Moon by the full Moon in the Rule, becauſe that happens about four Days before the 14*th* of the Moon by the Church-Calendar. 2. If the full Moon meant in the Rule be any Day after the 14*th* of the Paſchal Moon by the Church-Calendar, then as often as the ſaid 14*th* happens to be *Saturday*, and conſequently the full Moon meant in the Rule to be the *Sunday* following at ſooneſt (that being the very next Day) that *Sunday* cannot be *Eaſter-day* by the Rule; whereas by the Table and Practice it is. Thus *Saturday*, *April* 4. 1702. was the 14*th* day of the Moon by the Church-Calendar; and therefore if the full Moon meant in the Rule were any Day after that, it muſt have been on *Sunday April* 5. at ſooneſt; conſequently *April* 12 at ſooneſt muſt have been *Eaſter-day* by the Rule; whereas *April* 5. was *Eaſter-day* by the Table and Practice: And this evinces the miſtake of thoſe, who make the 15*th* day of the Moon to be the Full in the ſenſe of the Rule; as Dr.* *Wallis*, Mr. *Wright*, in his *Poſtſcript* to his *Short View of Mr.* Whiſton'*s Chronology*, *&c.* and the *Introductio ad Chronologiam* (Reprinted at *Oxford*, *A. D.* 1704.) p. 37.

* *N.* 240. *Abr.* Vol. III. p. 402.

2. I prove the ſecond Obſervation neceſſary to the ſame end; becauſe a full Moon in the ſenſe of the Rule, (*viz.* the 14*th* day of a Moon by the Church-Calendar) often happens on *March* 21. and in that caſe the *Sunday* following is always *Eaſter-day* by the Table and Practice; whereas it muſt be a Month after by the Rule, unleſs we underſtand theſe words, [next after *March* 21.] as I explain them. And this will be the caſe next Year (1706.)nor doth the proof of this point need the ſuppoſition of the foregoing, (tho' that may now be fairly ſuppoſed, as being already prov'd) for, count you the full Moon how you will, *March* 22. can never be *Eaſter-day* by the Rule, unleſs *March* 21. may be the Paſchal full Moon by the ſame; and yet *March* 22. is *Eaſter-day* by the Table and Practice, as often as the Golden Number is 16, and the Dominical Letter D.

I am aware that this 2d Obſervation may ſeem to many forc'd and unnatural; and that, perhaps might induce ſome to count the 15th Day of the Moon for the full in the Rule, and Mr. *Thornton*, to ſubſtitute *March* 20. in Leap-years for *March* 21. neither of which *Hypotheſes*, however, do any Service, all things conſider'd. The former indeed would vacate my ſecond Obſervation, (*March* 21. never being the 15th day of the Moon by the Church-Kalendar) but then it would make the Rule notoriouſly irreconcilable with the Table and Practice, as hath been already ſeen. And, as to Mr. *Thornton*'s *Hypotheſis*, 1. The only Colour for it (*viz.* That at the time of the Council of *Nice* the *Vernal-Equinox* was *March* 20. in Leap-years, and not *March* 21. as in common years) is, for any thing that I know, more likely to be falſe than true, and doth by no means follow from the Intercalation. 2. If this Colour were true, it were too great a Nicety to have been probably regarded by the Church. 3. This *Hypotheſis* puts more force upon the words of the Rule than mine. And laſtly, If it were admitted, it would ſolve the Difficulty only in Leap-years, and my ſecond Obſervation would ſtill remain neceſſary, becauſe the Caſe happens as well in Common as in Leap-years, whereof we have an Example in the Year (1706.) Nor will my ſecond Obſervation be much boggled at by thoſe that know and conſider the incluſive way of reckoning uſed by the *Romans*, and from them deriv'd to all the *Latin* Churches, and particularly that of *England*; for 'tis as proper to ſay [next after *March* 21.] with the meaning I contend for, as to ſay, *Tertio (ante) Calendas, Nonas vel Idus* in the ſenſe of the *Roman* Kalendar; or, as to ſay (as our Church doth a little after this Rule for *Eaſter*) that *Aſcenſion-day* is forty days after *Eaſter*, intending *Eaſter-day* itſelf to be one of thoſe forty. And 'tis obſervable in this very Rule, that, after it had been ſaid, that *Eaſter-day* is always the firſt *Sunday* after the full Moon, *&c.* 'tis added, That if the full Moon happens on a *Sunday*, *Eaſter-day* is the *Sunday* after; which had been a groſs Tautology, if by the firſt *Sunday* after the full Moon might not be underſtood the day of the full Moon itſelf, when happening to be *Sunday*. And if the *Sunday* of the full Moon may be ſignified by the firſt *Sunday* after the full Moon, then the full Moon of *March* 21. may be ſignified by the full Moon next after *March* 21. 3. I prove that my two Obſervations are ſufficient to reconcile the Rule and the Table; becauſe I my ſelf have drawn up a Table to find *Eaſter* for ever, by the Rule underſtood according to thoſe Obſervations, and in the plain and obvious Senſe in all other Reſpects, and upon comparing, have found it to agree in every particular with the Table for the ſame purpoſe in the Common-Prayer-Book; and any body elſe may make the ſame Tryal; which Method, if others had taken to examine their Explications of the Rule by, they muſt have diſcovered their Miſtakes.

Of the ancient Greek *and* Roman *Lyre, by Dr.* Tho. Molyneux, *n.* 182. *p.* 1267.

III. After all the extraordinary Recommendations the Criticks have been pleaſed to beſtow upon the 3d Ode of the 4th Book of *Horace*; yet one of the moſt beautiful Paſſages, and ſurprizing Fancies of the *Ode*, ſeems to me to have been ſo overlookt by them, that neither they nor any of the Commentators, I have hitherto had an Opportunity to conſult, and I have examined the moſt chief of them, as *Lambin*, *Minellius*, *Bond*, *Deſpres*, *Dacier*, &c. have fully comprehended the meaning of the Poet, or the whole ſcope of his Senſe, which he expreſſes in theſe Words,

O Teſtudinis aureæ
Dulcem quæ ſtrepitum, Pieri, temperas!
O mutis quoque Piſcibus
Donatura Cygni ſi libeat ſonum!

I muſt freely own, when firſt I reflected on theſe Lines, and obſerved *Horace*'s great Heat and Vehemency, in his repeated Exclamation, upon admiring his Muſe's Power, becauſe ſhe could give when ſhe pleas'd even to *Mute Fiſhes*, the melodious Voice of the Swan, I was not a little ſhockt and confounded, for I lookt upon the Fancy as perfectly forced and groundleſs.

So I put my ſelf to conſider a little, whether upon ſecond Thoughts, I could not diſcover what might be the true Intention of the Poet in theſe Lines, and after peruſing them a while, what was before dark and obſcure, appeared ſo plain and evident, that I was immediately convinced in my ſelf, he could not poſſibly have any other Meaning than this.

After he had in the Verſes going before, acknowledged how much he was owing to the Bounty of his Muſe, here he makes a ſudden Exclamation to extol her great Art and Maſtery, who by mixing various Notes, could compoſe ſuch ſweet Harmony upon the *Guilded Lyre* or *Teſtudo*, and by her ſurprizing Power could when ſhe pleaſed, give even to mute Fiſhes, or the hollow Shells of the *Teſtudines Aquaticæ* or *Water Tortoiſes*, a ſort of Fiſh, of which I imagined they made their Lyres in old Times, the ſweet Melody of the Swan. As for the Compariſon he makes to the Voice of a dying Swan; tho' this were granted an Error, yet I thought it ſuch a one, as might paſs very well, ſince it ſerves here only as an Alluſion, and might be uſed for that end, becauſe it was certainly a received vulgar Opinion in *Horace*'s Days, as it prevails ſtill in ours; and therefore might properly enough, tho' a Fiction, illuſtrate this mighty Attribute he in ſuch poſitive Terms, and in ſo ſurprizing a manner aſcribes here to his *Muſe*: for even a *Vulgar Error* univerſally imbraced, was ever Authority ſufficient for either a Poet or an Orator to draw from it a Compariſon or a Simile.

Monſieur Dacier I confeſs, has nothing that in the leaſt favours the foregoing Explanation; but on the contrary in his Gloſs upon theſe words in the ſame Ode.

Totum Muneris hoc tui eſt, &c.

Says, *Horace* could not have given a more ample Teſtimony of his Modeſty, than he has ſhewn in this Expreſſion, which aſcribes all the

Merit he had wholly to the Gift of his Muſe, who might, ſays he, if ſhe ſo pleaſed, have made even a mute Fiſh ſpeak; which intimates, 'twas a thing he imagined ſhe had never done; tho' according to my Sentiments, the Harmony of every ſpeaking Lyre, was then no leſs than the Voice of a dumb Fiſh, raiſed by the power of the Muſe in the Allegorick manner of ſpeaking they affected in thoſe Days, which now we ſhould ſay was done by the Skill of the Muſician.

Upon Enquiry whether the *Teſtudo* or *Lyre* of the Ancients, was made of the back or hollow Shell of the *Tortoiſe*, as the name ſeem'd fully to import; it appeared from ſeveral Hands, 'twas a current piece of Hiſtory, generally receiv'd among the Ancients, that *Mercury* was the firſt Inventor of the *Lyre*, (whence *Horace* Lib.I. Ode 10. ſtiles him *Curvæ Lyræ Parentem)* and that he made it of the Shell of a dead *Tortoiſe*, he accidentally found on the Banks of the River *Nile*.

The firſt Teſtimony I ſhall take from an old Phyſician, a *Greek* Poet, that writ above a hundred Years before *Horace*, I mean *Nicander* in his Poem he calls *Alexipharmaca*, where ſpeaking of the Antidotes proper againſt the Poiſon of the *Salamander*; he recommends both the *Sea* and the *Mountain Tortoiſe* in theſe Words.

Ἀμμίγδην ἁλιοίο καθεψηθέντα χελώνης
Γυίοις, ἢ ταχινῆσι διαπλώει πτερύγεσιν
Ἄλλοτε δ' οὐρείης κυτισηνόμου ἣν τ' ἀκάκητα
Αὐδήεσσαν ἔθηκεν ἀναύδητον περ ἐοῦσαν
Ἑρμείης, ζαρκὺς γὰρ ἀπονόσφισε χελείον
Αἰόλον, ἀγκῶνας δὲ δύω παρετείνατο πέζαις.

Which I find thus tranſlated by *Johannes Gorreus* a *Pariſian* Profeſſor of Medicine of the laſt age.

Cum curva auxilia veniunt Teſtudine.----
Quæ Pelagi fluctus velocibus innatat alis,
Aut montana etiam Cytiſo quæ veſcitur & quam
Reddidit e muta modulanti voce canoram
Mercurius, picto inſontis qui Cortice carnem
Exemit, geminumq; Ancona intendit in oris.

Jacobus Grevinus * gives us an ample Comment on theſe Verſes, and relates at large the Hiſtory of the firſt Lyre; which I refer the Reader to, rather than tranſcribe it here; but this I cannot but take notice of (by way of Supplement to what he ſays) this Verſe ---

Αὐδήεσσαν ἔθηκεν ἀναύδητον περ ἐοῦσαν;
Reddidit e muta Modulanti voce canoram.

--- Is ſo home and appoſite to our preſent purpoſe, and comes up ſo cloſe to *Horace*'s Thought.

* *Lib. I. de Inſtrumentis. p. 7.*

O mutis quoque Piſcibus
Donatura Cygni ſi libeat ſonum.

That it does not only explain the true meaning of it, but makes me inclinable to believe the *Roman* might have in his view this very paſſage of the *Greek* Poet when he writ theſe Lines; for whoever is moderately converſant in the *Greek* and *Latin*, will eaſily be of opinion, that the latter frequently borrow'd not only their thoughts and fancies from the former, but even ſometimes they copied as near as poſſible, their very turns and expreſſions, conſidering they writ in a differing Language; yet this muſt be allow'd, they uſually ſurpaſſed thoſe they drew from, and the Copies went beyond their firſt Originals, as *Horace* I think has here outdone *Nicander* in his fancy, which I perceive he has been ſo fond of, that he was not only ſatisfied to uſe it in this place, but has it again, tho not ſo expreſly, where he invokes his Lyre in this manner.

Tuque Teſtudo reſonare ſeptem
Calida nervis
Neque Loquax olim neque grata---

Which laſt Line is a plain comment to ſhew what he means in this place.

O mutis quoque piſcibus, &c.

The other inſtance I ſhall mention, is from one of ***Lucian***'s Dialogues, who writ above a hundred Years after *Horace*, whence 'tis plain the Mechaniſm of the antient Lyre, and the Opinion concerning its firſt invention, prevail'd ſince, as well as before *Horace*'s Days. In this Dialogue he introduces ***Apollo*** and ***Vulcan*** talking after his jocoſe way of *Mercury* to this purpoſe.

Απ χελώνην πȣ νεκράν εὑρὼν, ὄργανον ἀπ αὐτῆς συνεπήξατο, πήχεις γὰρ ἐιάρμοσας, καὶ ζυγώσας, ἔπειτα καλάμȣς ἐμπήξας, καὶ μαγάδιον ὑποθεὶς, κατὰ ἐντεινάμενος ἑπτὰ χόρδας, μελῳδεῖ πάνυ γλαφυρὸν ὦ Ἡφαίστε καὶ ἐναρμόνιον.

Ap. *Teſtudinem mortuam alicubi offendens Inſtrumentum ex ea concinnavit; Brachia enim adaptans Jugum oppoſuit, deinde Clavos infigens, & Hamiſpharium repandum infra ſubjiciens, ſeptem Cordas extendebat, atque modulabatur quiddam valde ſonorum, O Vulcane, & ad Muſica Melodiam compoſitum.*

I borrowed the firſt of the following Figures from that excellent Treatiſe of the Harmonicks of the learned Father * *Marinus Merſennus.*

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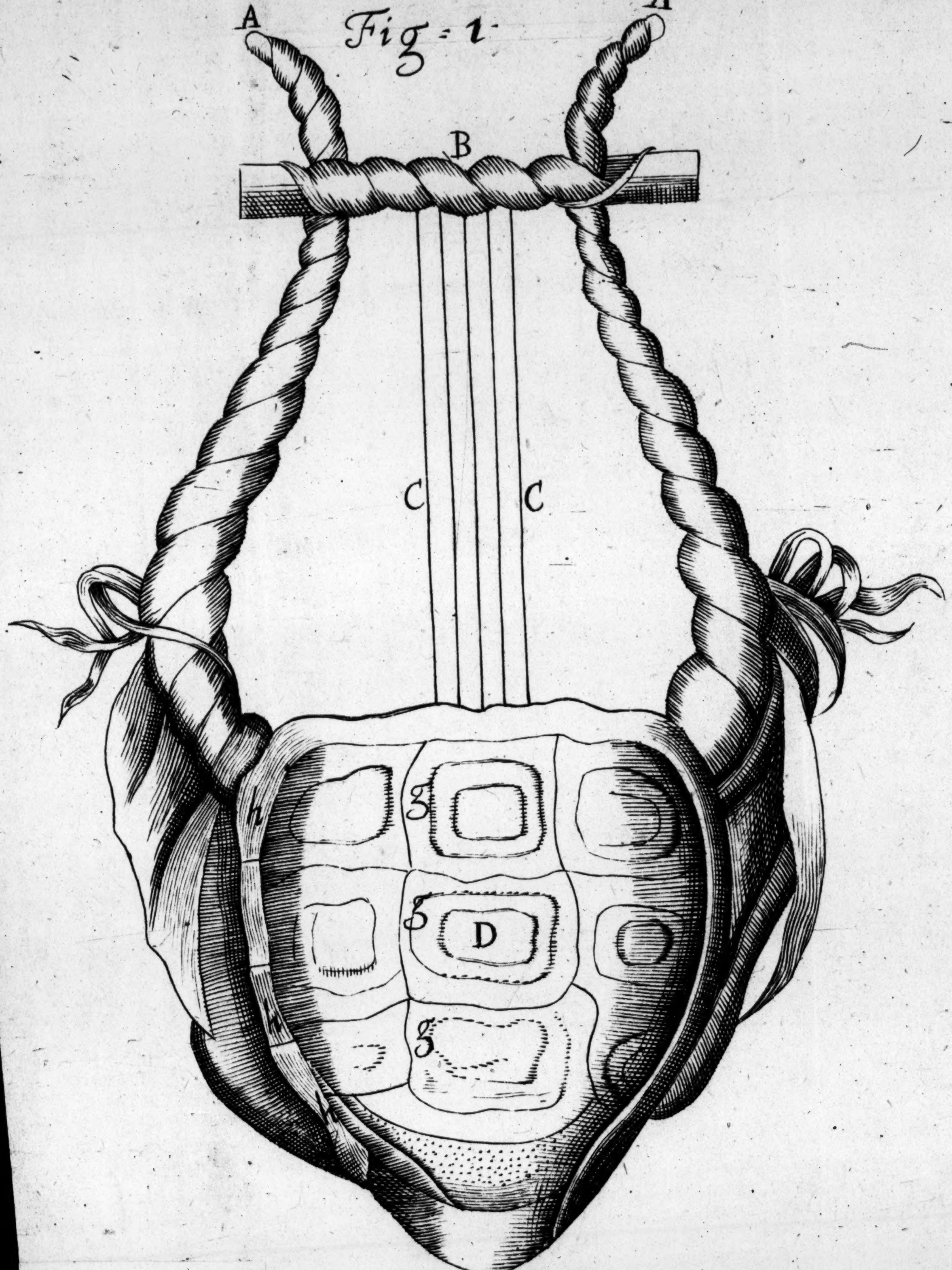
* *Lib.* I. *de Inſtrum. p.* 7.

Fig: 1.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f: 2.

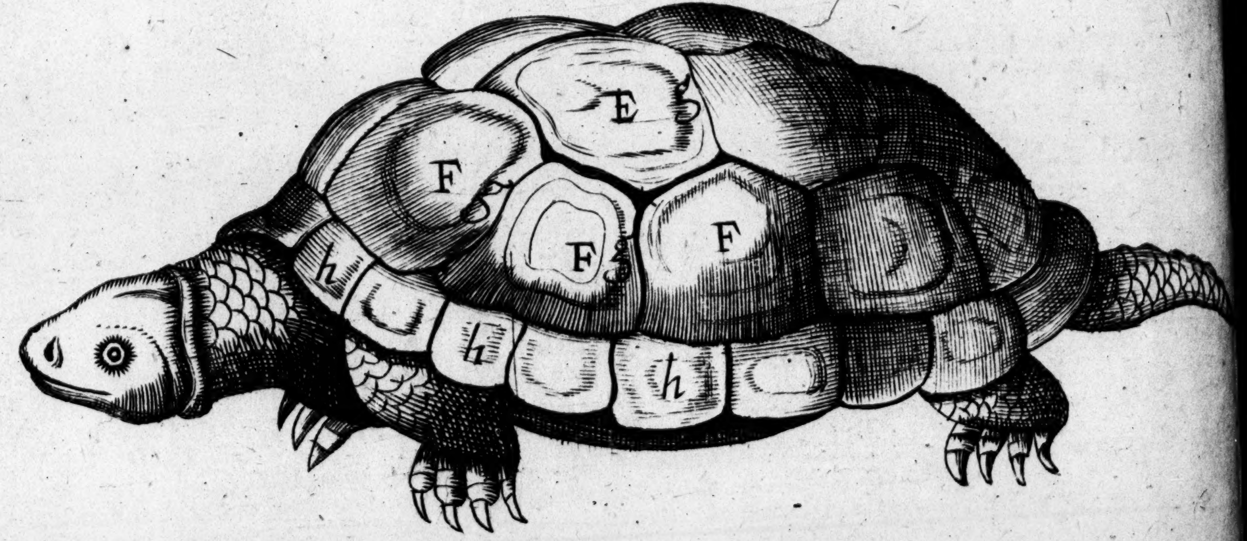
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Figure the firſt repreſents the ancient *Lyra* or *Teſtudo*, and the Father tells us he copied this Figure (which I have expreſt in ſomewhat a larger ſize, that it might the better agree with the proportion of the annext Scheme) from the Sculpture of an Antique Gemme that belong'd to one *Jacobus Gaffarellus.* *A A* ſhew the πήχεις of *Lucian* the Ἀγκώνες or *Brachia* of *Nicander*, made of the Horns of ſome Beaſt. B the Ζύγος or *Jugum*, in which were faſtened the κάλαμοι *Clavi* Pegs that raiſed or depreſt, *c c* the χορδαὶ or Strings, which were fixt at their t'other end to *D* the μαγάδιον *Hemiſpherium* or Belly. Of the Lyre of this part of the Inſtrument the good Father not having, I ſuppoſe, well conſider'd, or throughly inquired into the matter, ſays, that it ſeem'd *Teſtudinis Dorſum Ventrem ſeu Teſtam repreſentare*; where 'tis plain 'twas more than a reſemblance, and was really deſigned to expreſs the thing itſelf; as appears by the ſecond Figure of an intire *Teſtudo Aquatica* or rather *Fluviatilis*, as *Cicero* calls it (in his *Natura Deorum*) taken from *Johnſtonus de Animalibus* as delineated in his eightieth Table *de Quadrupedibus*. Whoever compares theſe two Figures, tho but little converſant in the natural Hiſtory of Animals, and will but make allowances for their different poſture, one being repreſented full and in a flat poſture, whilſt only half of the t'other appears, becauſe 'tis ſhewn ſide ways, will ſoon be convinc'd of this truth.

For if we obſerve how the Belly of *Merſennus* his antient Lyre markt D. agrees nicely in Figure and Shape with the Back or Shell of *Johnſtonus* his *Teſtudo Aquatica*, markt *E*, how they are both curiouſly teſſellated and checker'd into Areas or Scales *F. F. F. F. F. F.* of ſomewhat a ſquare Figure, and each of theſe Scales again in both ſo neatly wrought about their edges with a line running parallel to their Margins *g. g. g. g. g. g.* and how the Shell of the Lyre, as that of the Tortoiſe, terminates in a narrow Limb or Verge, cut into ſmaller Scales *h. h. h. h. h. h.* incompaſſing the whole; whoever I ſay, remarks this accurate agreement of the two Figures in all theſe particulars, muſt at the firſt view be ſatisfied they were taken from the ſame object; and tho' drawn by different Artiſts, may be at two thouſand Years diſtance, yet both manifeſtly own the lineaments of the ſame natural Original.

This too fully appears from a paſſage in *Pauſanias* his deſcription of *Greece*, as I find it quoted by *Geſner* (for I have not the Author himſelf by me) which mentions a Mountain in *Arcadia*, called *Parthenius Mons*, *qui Teſtudines exhibet ad compingendas Lyras aptiſſimas*; and the ſame Author again ſays in another place, *Arcadum Querceta ingenti magnitudine Teſtudines exhibent, ex quibus Lyras conficeres æquales illis quæ ex Indica Teſtudine componuntur.* From whence 'tis plain the Antients made their *Lyres* of the Shells of *Tortoiſes*; and we may likewiſe conclude from hence, that in the beginning of times, e're the skill of Muſick, or the art of making its Inſtruments arrived to any perfection, the greateſt Maſters in both ways were not over-nice and curious in the choice of their materials, but promiſcuouſly the *Land* or *River Tortoiſe* to make their Inſtruments of, as this or that came more opportunely in their way, which occaſions *Pauſanias* and *Nicander* to mention the *Mountain*, whereas *Horace* ſpeaks of the *River Tortoiſe*; of which therefore we may ſuppoſe his *Lyre* was made. And indeed, if we conſider the true riſe or way of Invention of all ſorts of Tools, Weapons, Machines and Inſtruments that now prevail in the World (eſpecially thoſe of Muſick, which are what we are now diſcourſing of) from their firſt Beginnings, we ſhall find they conſtantly derived their Origine, and borrowed their firſt materials from ſomewhat that was natural, rude, plain, ſimple and eaſy to come at. Thus all the variety of curious Pipes now in uſe, as the *Flute*, *Flagelet*, *Hautboy* and *Organs* themſelves, tho ſo artificially contrived, and exquiſitely wrought, certainly owe their Beginnings to, and are only refined improvements of the *Tenues Avena* or *Oaten Pipes* of the Field, or the *Calami impares Juncti* of the Antients, *Reeds* of unequal lengths rudely put together; and thus we ſee the Trumpets of old were at firſt made only of rude *Horns*, the eaſy ſpoils of Beaſts, and ſometimes of the common *Buccina Whelks* or large Sea Shells that were obvious, and readily found on every Rock or Sea Shore.

And afterwards when the *Roman* People inlarged their Empire, grew more polite, and all their Mechanick Arts received mighty improvements, tho' they had then learnt to make theſe ſame Inſtruments of different and more commodious ſhapes, and framed them of quite other ſorts of materials, yet ſtill they retained their firſt old Names, and ſo the *Teſtudo* did, by which we might as eaſily trace it as theſe to their primitive originals.

For 'tis very manifeſt, that in ſucceeding Ages, as the skill of the Mechanick Artiſt, that wrought and contrived the *Lyre*, as well as that of the Muſician that uſed the Inſtrument, arrived at a greater height, the Model of the old *Teſtudo* was much alter'd, the number of the Strings increaſed, and the ſhape ſo mightily diverſifyed, that at length they wholly laid aſide the *Tortoiſe-ſhell*, and the ſonorous part or Belly of the Lyre, was made of ſuch different Figures, that they bore not the leaſt reſemblance to its firſt Model. This plainly appears from thoſe other Schemes *Merſennus* gives us in the ſame Table of ſeveral ſorts of the antient Lyres (but theſe I take to be more modern than that which is here expreſt) and from thoſe deſcribed by *Leonardo Agoſtini*, in the ſecond part of his Collection of the *Gemme Antiche*, which ſhews us, that as the fancy of the Workman, Model of the times, real Convenience, or an imaginary Beauty in the Inſtrument determined it, they were faſhioned into various ſhapes, and frequently like their *Lamps* of old into capricious fantaſtical odd Figures.

Of the Roman *Legions, by Dr.* Muſgrave, *n.* 337. *p.* 80.

III. LEGIO res, ut Romana vox eſt, a legendo milites in delectu (1) ſumpta. Legionum ante Auguſtum Cæſarem, alius omnino ſtatus & conditio fuit, atque poſt illum Imperatorem; ſive earum Numerum ſive

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(1) Varro de L.L. lib. 4.

militum in earum ſingulis contentorum (de his duobus verba præcipue facturus ſum) animo contemplemur.

ANTE *Auguſtum* illæ Ducum erant notæ in gerenda repub. eximiæ virorum, & ab iis, a quibus ſeu dilectæ, ſive rectæ fuerunt, aliquando *Nomina* cepere. *Legiones* a *Valerio Flacco* conſcriptæ, ab eo dictæ ſunt (2) *Valerianæ*; ſed cum iiſdem imperitavit *Fimbria*, dictæ ſunt ab eo (3) *Fimbrianæ*.

MILITUM in *Legione* numerus ſtante Repub. dubius, alias major, alias minor fuit; ſed qui, maxima ex parte, gradatim auctus: Ita vero, ut plerumque minor quam ſub Imperatoribus inveniretur. *Romuli* prima *Legio* Peditum tria millia, ſecundum *Varronem*, eſt complexa, [*Milites* (4), ait, *quod trium millium primo Legio fiebat.*] *Plutarchus* (5) hiſce trecentos Equites adjecit. Poſtea pro uſu Reipub. & Senatus arbitrio, ad quatuor (6) millia, ad quingentos (7) ſupra quatuor millia, ad quina (8) millia & ducenos Pedites, ad ſena Peditum millia, & Equites trecenos, accrevit. Id autem, quod diligenter obſervandum, non ex *Romanorum* more uſitato, & communi uſu, vel lege aliqua, ſed vel ex periculo quodam imminente, (ut in Bellis *Punico* (9), *Macedonico* (10), *Mithridatico* (11),) vel Imperatoris (uti *Marii*, in Bello (12) *Jugurthino*; *Antonii*, in Bello (13) *Civili*) auctoritate, non ex Senatus decreto factum eſſe liquet.

HIS, de militum in *Legione* numero, ſub Regibus & Reipub. initio dictis, adverſari cenſentur ea, quæ ex *Plutarcho* & *Eutropio* citantur. A *Plutarcho* (14) ſcriptum eſt, Διπλασιαθείσης δὲ τῆς πόλεως, ἑκατὸν μὲν ἐκ Σαβίνων πατρίκιοι προσκατειλέχθησαν, αἱ δὲ λεγεῶνες ἐγένοντο, πεζῶν μὲν ἑξακιχιλίων, ἱππέων δὲ ἑξακοσίων. Id eſt, *Civitate jam in duplam aucta*, Sabinis *ea donatis, ex iis alios centum Patricios eligebant: Legiones autem fiebant; Peditum ſex millium, Equitum vero ſexcentorum.* Quæ utique verba moras *Stewechio*, *Savilio*, *Roſino*, *Panvinio*, *Sigonio* facientia, ex *Dionyſ.* (15) *Halicarnaſſenſi* optime noſtra quidem opinione ſic explicantur. Erant *Romulo*, poſt odioſam illam cum *Remo* fratre pugnam, e veteribus colonis, qui cum eo *Romam* condidere, quaſi tria Peditum millia, pauciores quam trecenti Equites. Civitate vero duplicata, & cum ea ſimiliter Patriciorum numero, duplicata etiam eſt Militia: Sic, ut *Plutarchus* non tam de numero militum in una eademque Legione, quam de numero Legionum aucto (pariter atque de aucta Civitate, & de numero patriciorum aucto) itaque de militibus in iis συναθροισμένοις intelligi mereatur. Quæ quidem ejus ſignificatio, illorum temporum mori cum primis convenit: Certiſſimum enim eſt (imo quidem, ipſo tradente *Plutarcho* (16), certiſſimum) Legionem a *Romulo*, quod ante dixi, inſtitutam, Peditum fuiſſe trium millium, Equitum trecentorum. Unum erraſſe videtur Hiſtoricus, in re militari non nimis accuratus, quod primas Romuli Legiones Συντάγματα στρατιωτικὰ, referat in plurali numero; quando diligentiſſimus inveſtigator antiquitatis, Varro [*trium millium*, (17) ait, *primo Legio fiebat, ac ſingulæ Tribus* Tatienſium, Ramnium, Lucerum *millia ſingula militum mittebant:*] quod de unica tantummodo *Legione* ſubintelligendum, & lucem iſti fœnerat interpretationi. *Optimi Scriptoris* (ſcil. Plutarchi) *bonam hanc mentem mavult* Lipſius (18), [Romulum *duplicaſſe Legiones populo jam duplici, & binas feciſſe tot millium.*]

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(2) *Salluſtii* Fragmenta, & ad ea Douzæ Notas. Cantabrigiæ, MDCCX. pag. 73. (3) Pag. 74. (4) *Varro* de LL. Lib. IV. (5) In Romulo. (6) *Livii* Lib. VI: Cap. XXII. (7) Lib. VII. Cap. XXV. (8) Lib. XLII. Cap. XXXI. Cum quina millia & ducenti pedites ex veteri inſtituto darentur in Singulas Legiones. Vide ad hunc locum Doctiſſimi *Perizonii* notam. (9) Livii L. XXIX. Cap. XXV. (10) L. XLII. Cap. XXXI. (11) Appianus de Bellis Civilibus, Lib. IV. (12) Salluſtii Bellum Jugurthinum § XCI. Roſini Antiquitates Rom. Lib. X. Cap. IV. (13) Appianus Alex. de Bellis Civilibus, L. V. (14) In Romulo. (15) Dionyſ. Halicarnaſſenſ. Lib. II. § 16.

EUTROPII dictum (19) eſt [*Cum* Latini, qui a Romanis *ſubacti erant, milites præſtare nollent, ex* Romanis *tantum tirones lecti ſunt, factæque Legiones decem, qui modus ſexaginta vel amplius armatorum millia efficiebat.*] Fallitur, inquit doctiſſima Fæminarum *Anna* (20), & ita erraſſe *Eutropium* miratur, cum expreſſe *Livius* (21) hac de re [*Ubique non urbana tantum, ſed etiam agreſti juventute decem Legiones ſcriptæ dicuntur, quaternum millium & ducenorum peditum, equitumque trecenorum.*] Ego potius, quamvis a Femina tam illuſtri diſſentire vix ſuſtineam, *Eutropii* manuſcripti exſcriptorem erraſſe puto; (neque enim Hiſtoricus, diligenter magna ex parte & accurate ſcribens, levi de cauſa temereque arguendus,) & quidem hunc in modum erraſſe. Scripſiſſe videtur *Eutropius* [XL, *vel amplius armatorum millia.*] Exſcriptor autem, literas numerales, quod in proclivi eſt, tranſponendo [LX.] Hoc cum *Livio*, unde id hauſiſſe videtur *Eutropius*, ad amuſſim quadrat.

ALIUD eſt, quod a ſignificatione vocis *Centuria* ductum, opinioni de militum in Legione ſub prima Repub. paucitate, videatur oppugnare; *Varro* (22) ait [*Centuriæ, quæ ſub uno* Centurione *ſunt, quorum Centenarius juſtus numerus:*] Hac Etymologia quidam, ſed nec ii de Literatorum vulgo, freti, cum Legio Centuriones habet ſexaginta, quod ita eſſe Lex juſſit (teſtante *Dionyſio* (23) *Halicarnaſſenſi*, & apud *A. Gellium Cincio* (24), ducto ſexageſimo in centeſimum numero, *Legionem* militum ſex millia, quaſi calculi auctoritate, continere pronunciant. Sic a non nemine dicitur [*Legio ſexaginta Centuriarum, ſeu ſex millium.*] At minime novum eſt, voces a prima ſignificatione plurimum deſciſcere. Vocem hanc *Centuriam*, utut de numero centenario primum uſurpatam, ſucceſſu temporis de numero multo minori fuiſſe dictam, ex *Tacito* (25) patet. Milites in ſeditione *Germanica* ſub *Tiberio* ſævitiam Centurionum ulciſcentes, [*in eos invadunt, proſtratos verberibus mulctant ſexageni ſingulos, ut numerum Centurionum adæquarent.*] Manifeſtum hic ſexagenis ſolum præfuiſſe Centurionem. Quid quod iſthuc verbo tenus argumentum, nequaquam ipſa cum re concordet: cum in omni *Romana* Hiſtoria, quæ *initio reipub.* militum ſex millia comprehendat, Legio nulla reperiatur.

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(16) In *Romulo*. Κτισθείσης τῆς πόλεως, πρῶτον μὲν ὅσον ἦν ἐν ἡλικίᾳ πλῆθος, εἰς συντάγματα στρατιωτικὰ διεῖλεν. Ἕκαστον δὲ σύνταγμα πεζῶν τρισχιλίων ἦν, καὶ τριακοσίων ἱππέων.

(17) Varro de Lingua Lat. Lib. 4to.

(18) De Militia Rom. Lib. I. Dial. V.

(19) Lib. II. § VI.

(20) In ad eum Eutropii locum Notis.

(21) Lib. VII. Cap. XXV.

(22) Loco jam citato.

(23) Antiq. Roman. IX. Cap. X.

(24) Noct. Attic. Lib. XVI. Cap. IV.

(25) Annalium Lib. I. Cap. XXXIII.

SUB exitum Reipub. cum, e viris in ea principalibus, ſuo fere quiſque uſus eſt ingenio, *Luculli* (26) Legiones habuerunt ſingulæ ſex millia Peditum, trecentos Equites. *Cæſaris* Legiones millium erant ternorum: [Cæſar *cum Legionibus quæ terna millia militum* Italorum *habuerunt*, Gallias *ſubegit.*] Ita *Sextus Rufus* (27). Nobilis *Savilius*, neſcio qua auctoritate, legit *quaterna. Antonius* (28) poſt Prælium *Philippicum* de Legionibus, μετὰ τῶν συντασσομένων, id eſt, miſtis auxiliis, ita ſcripſit, ut Legionum ſingula ſex millium ſit; adeoque ſine auxiliis, trium. Idem in *Luculli* Legionibus ſuſpicandum arbitror, adnumerari ſcil. Auxilia; & ad numerum ter milleſimum eas, per ſe conſideratas, redigi oportere.

ALIA ſub *Cæſaribus* Legio fuit, ut in aliis pleriſque rebus, ita præſertim in numero militum; qui jam inde, *Cæſarum* mandato, maxima ex parte ſexies milleſimus, interdum eo major invenitur. Hoc ex *Vegetio* manifeſtum eſt, de hac re ita verba faciente (29), [Romani *Legiones habent, in quibus ſingulis ſena millia, interdum amplius militare conſueverunt*;] & (30) alio loco [*Legio plena habet Pedites ſex millia centum, Equites ſeptingentos viginti ſex.*] Non de ſuo tantum ævo *Vegetius* hæc ſcripſiſſe judicandus, ſed ad illorum, a quibus ſuam de re militari conſcripſit Epitomen; in quorum numero fuit *Cornelius Celſus*; de quo *Volaterranus* (31), [Cornelius Celſus, *inquit, de Arte Rhetorica,* de re militari, *de re ruſtica, deque medicina libros conſcripſit, verum ad nos tantum pervenit ejus medicina, oratorio modo conſcripta.*] Ipſius etiam *Auguſti* de re militari Conſtitutiones (quarum una a *Macro* J. C. in Pandectis (32) ſervata eſt), *Vegetius* ſe evolviſſe narrat. Quinimo profitetur (33) [*Nihil ſibi auctoritates aſſumere, ſed horum quos ſupra retulit, quæ diſperſa ſunt* (in *Catone, Celſo, Frontino, Auguſti, Trajani, Adrianique* Conſtitutionibus) *velut in ordinem epitomata conſcribere.*) Quare veriſimile duco, ſub *Auguſto*, vel *Tiberio*, (quo Imperante *Celſus* ſcripſit) militum in Legione numerum ad ſexies milleſimum augeri, & nunquam poſt attenuari, eoque numero minorem reddi; quod partim ex *Frontino*, partim ex eo junioribus *Modeſto*, *Heſychio*, & *Suida* patet. *Modeſtus* (34) ait [*Iis decem Cohortibus* Legio plena *fundatur, quæ habet Pedites* VI *Mill.* CV, *Equites* DCCXXVI.] Ille *Tacito* Imp. floruit, eique [*de vocabulis rei militaris*] Libellum inſcripſit. *Heſychius* (35) Λεγεὼν πλῆθος στρατεύματος ἢ τάγματος ἐξ χιλιάδων ἑξακοσίων ἑξήκοντα ἕξ. *Suidas* (36) autem Λεγεὼν παρὰ Ῥωμαίοις ἑξακισχίλιοι στρατιῶται. *Legio* apud *Romanos* ſex millibus militum conſtans. Adeo patet ab *Auguſto*, *Romani* Imperii conditore, ad ejus uſque terminum, Legionem ſena millia (& eo amplius aliquando) continere. Hæc de numero Militum in *Legione plena* hactenus.

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(26) Appian. de Bellis Mithridat. pag. 368. (27) In Breviario. (28) Appian. de Bellis Civilibus, Lib. V. p. 1075. Ed. Amſt. MDCLXX. (29) De re militari; Lib. II. Cap. II. (30) Cap. VI. (31) Lib. XIV. (32) Digeſt. Lib. XLIX. Tit. XVI. (33) De re militari, Lib. Cap. VIII. (34) Lugduni Batav. ex officina Plantin. CIↃIↃXCII. Pag. 291. (35) Voce Λεγεών. (36) Ibi.

AD Legionum altero loco numerum deſcendamus, & quotus ille fuerit, eodem tempore, quoad ejus fieri poteſt, inveſtigemus. Diverſis temporibus diverſum fuiſſe conſtat, & neceſſe eſt; prout Bella nunc gravia, nunc plura poſtularent, aut pace parum opus eſſent milites. Ex hac varietate de populi *Romani* variis ætatibus, ut & in earum ſingulis de ejus robore, uno conſpectu ſed & amœno, poſſimus aliqua ex parte judicare.

ROMULI ſicut dictum eſt, primo fuit Legio tantum una: Deinde, in duplum aucta Civitate, binæ. Tametſi *Milites Romani* (37) ad quadraginta mille, & eo amplius ſub *Romulo* augerentur; tametſi [*omnem militarem diſciplinam, artemque bellandi*] *Tullus Hoſtilius* a (38) *Floro* condidiſſe tradatur; Legionum tamen numerum, ſub Regibus, ultra binas augeri nullus invenio.

IN *omnibus auctoribus*, ait (39) *Vegetius*, *invenitur*, *ſingulos Conſules adverſus hoſtes copioſiſſimos, non amplius quam binas duxiſſe Legiones, additis auxiliis Sociorum. Tanta in illis erat exercitatio, tanta fiducia, ut cuivis bello duæ Legiones crederentur poſſe ſufficere*:] qno nihil a vero magis alienum. Nam e diverſo *Dionyſius*, Auctor graviſſimus, in Bello contra *Volſcos*, (40) Καὶ γὰρ δέκα στρατιωτικὰ τάγματα ἐξ ἀνδρῶν πεντακισχιλίων ἕκαστον. Τούτων τρία μὲν ἑκάτερος τῶν ὑπάτων ἔλαβεν καὶ τῶν ἱππέων ὅσον ἑκάστῳ προσεμερίσθη. *Decem*, inquit, *Legiones conſcriptæ ſunt,---ex his Conſules utrique ternas accepere, & Equitum quantum unicuique diſtributum eſt.*] *Livius* (41) de eodem Bello [*Legiones decem effectæ ſunt. Ternæ inde datæ Conſulibus: quatuor Dictator uſus eſt.*] Plures ſæpenumero fuiſſe Legiones certiſſimum eſt, & earum magna ex parte duas tantum ſub imperio Conſulum, reliquas Proconſulum, Prætorum, Proprætorum, Præſidum, Legatorumve mandatis obſequi.

Q. *Fabio* quartum & *M. Marcello* tertium Coſſ. A. U. Cond. circiter 538. [*Duodeviginti Legionibus bellum geri placuit.*] (42)

Fulvio & *Sulpitio* Coſſ. id eſt, A. U. Cond. circiter 541, [*Tribus & viginti Legionibus Romanis bellum terra marique geſtum.*] (43)

Ante prælium *Pharſalicum* erant *Cæſari* Legiones X, *Pompeio* XI; præter auxilia quamplurima (44).

Caſſio & *Bruto*, cum *Antonio* & *Octavio Cæſare*, pugnam inituris (45), erant pariter utrinque Legiones XIX. in ſumma XXXVIII.

Octavio Cæſari, devicto *Lepido*, Legiones erant quatuor ſupra quadraginta. (46)

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(37) Dion. Halicarn. Antiquit. Roman. Lib. II. Cap. XVI. (38) Lib. I. Cap. III. (39) Lib. II. Cap. IV. (40) Dionyſ. Hal. Antiq. Roman. Lib. VI. Cap. XLII. (41) Lib. II. Cap. XXX. (42) Livium, Lib. XXIV. Cap. XI. (43) Lib. XXVI. Cap. I. (44) Appianum de Bellis civilibus Lib. II. (45) Lib. IV. (46) Plutarchum in Antonio.

Eidem porro ſe a pugna ***Actiaca*** (47) ſubmiſere Legiones ***Antonii*** numero **XIX.**

Octavio rerum *Romanarum* undique potito, (reformata jam militia, & militum in Legione quavis numero ad ſexies milleſimum aucto) Legiones (48) erant **XXIII**; vel ut alii volunt **XXV.**

Sub *Tiberio* (49) Legiones erant **XXV.** ***Neroni***, tradente *Tacito*, Legiones erant quinque ſupra viginti: præter alias Legiones duas Claſſicas & in urbe **XII.** cohortes. Fuerunt igitur, ex ***Lipſii*** (50) calculo, civiles ei copiæ, Legionum circiter **XXX.**

Eundem ***Adriano*** fuiſſe numerum, ex celebri illo ***Favorini*** dicto manifeſtum eſt.

Dionis Cocceiani ævo, i. e. Imp. ***Alexandro Severo***, Legiones (48) erant **XXIX.**

AT omnium maxime Lapides ii ſunt æſtimandi, quorum alter *Capitolinus*, alter *Romæ* apud ***Maffæos***, numerum & nomina exhibent Legionum: Horum Inſcriptiones cum productis nominibus, accurate magis, quam unquam vidi, impreſſas, in medium feram.

Romæ, in *Capitolio*, Columella rotunda. **Nomina Legg.**

II. AVGuſta.
VI. VICTrix.
XX. VICTrix.
VIII. AVGuſta.
XXII. PRIMigenia.
I. MINERvia.
XXX. VLPiana.
I. ADIVTrix.
XIII. GEMina.
I. PARTHica.

I. ADIVTrix.
IIII. FLAViana.
VII. CLAVDiana.
I. ITALICa.
V. MACEDonica.
XI. CLAVDiana.
XIIII. GEMina.
XII. FULMinatrix.
III. GALLICana.
II. PARTHica.

IIII. SCYTHica.
XVI. FLAViana.
VI. FERRAta.
X. FRETEnſis.
III. CYRENaica.
II. TRAIana.
III. AVGuſta.
VII. GEMina.
III. ITALICa.
III. PARTHica.

Qui ſequitur Legionum Catalogus, trium numero auctior eſt.

II. AVGuſta.
VI. VICTRix.
XX. VICTRix.
VIII. AVGuſta.
XXII. PRIMigenia.
I. MINERvia.
XXX. VLPiana.
I. ADIVTrix.
X. GEMina.
XIIII. GEMina.
I. PARTHICa.

II. ADIVTrix.
IIII. FLAViana.
VII. CLAVDiana.
I. ITALICa.
V. MACEDonica.
XI. CLAVDiana.
XIII. GEMina.
XII. FULMinatrix.
XV. APOLLinaris.
III. GALLICana.
II. PARTHICa.

IIII. SCYTHIca.
XVI. FLAViana.
VI. FERRAta.
X. FRETEnſis.
III. CYRENaica.
II. TRAIana.
III. AVGuſta.
VII. GEMina.
II. ITALICa.
III. ITALICa.
III. PARTHICa.

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(47) Plutarchum in Antonio. (48) Dionem, Lib. LV. (49) Taciti Annal. Lib. IV. (50) Analecta ad Militiam Romanam.

INSCRIPTIONES has *Dionis* ævo poſteriores eſſe, palam eſt ex eo, quod plures utraque Legiones habeat, quam ab illo memorentur; unam ſcil. *Capitolinam*, *Maſſæanas* quatuor. Hæ de Legionum numero Diſſertationem claudunt; quando nihil amplius hac de re apud Hiſtoriæ Romanæ Conditores obſervare contigit.

HÆC, ex fidei bonæ Auctoribus & Lapidibus accepta, notatu digna præbent quamplurima.

Primo, ſub Conſulibus plures eodem tempore fuiſſe Legiones, quam ſub Imperatoribus; & ſub Regibus omnium pauciſſimas.

Deinde, ſub Conſulibus plures in Bellis Civilibus, quam externis.

Deinde, ſub Conſulibus minus certum earum eſſe numerum, & Copias magis variari, quam ſub Regibus aut Imperatoribus.

Deinde, ſub Imperatoribus, numerum quaſi ſolennem, ut ait *Lipſius*, eſſe XXX circiter Legionum.

Deinde, nemini unquam hominum plures fuiſſe Legiones, quam *Octavio Cæſari*; uti nemini unquam *Romanorum*, ex Sententia (51) *Lipſii*, Militiam florentiorem, quam *Trajano*.

Poſtremo, ex uno Legionum numero, de viribus exercituum, minime poſſe recte concludi.

BINI hic Canones ſanciri poſſunt, qui in *Romana* Hiſtoria, rei præſertim militari intelligendæ, uſui erunt non exiguo. Horum primus eſt: *Ubi militum numerus in exercitu, nullus autem Legionum numerus exprimitur,* [qui plerumque *Appiani* mos eſt] *ut exercitus ad Legiones reducatur, advertendum eſt illius ævum, & in eo quotus ſoleret eſſe militum in Legione numerus: Ducto enim eo in militum totius exercitus numerum, emerget in eodem Legionum numerus.* e. g. *Luculli* contra *Mithridatem* exercitus fuit [tradente [52] *Appiano*] Peditum 30,000, Equitum 1600: id eſt [dato in ſingulam Legionem numero 6200, qui miſtis auxiliis fuit iſtius ævi militum in Legione numerus] Legionum quinque. Septuaginta millium exercitus a *Boadicia* [tradente [53] *Tacito*] occiſus eſt; id eſt, datis, ſecundum iſtius ſeculi morem, unicuique Legioni 12000, ſex circiter Legiones.

CANON alter eſt, *Datis in Legione cujuſvis ſæculi militum, una cum Legionum in ejuſdem ſæculi exercitu numeris, orietur inde militum in eo exercitu numerus.* Hinc patet *Romuli* milites, Legione primum una comprehenſos, non exceſſiſſe 3000, vel ſecundum *Plutarchum* 3300. Deinceps, admiſſis *Sabinis*, & cum Civitate duplicata Legione, 6000, vel 6600. Nec quidem plures, etiamſi (quod ſupra diximus e *Dioniſio*) cum ex hominum conſpectu ſublatus hic eſſet, erant *Romæ* Milites 45,000. In Bello contra *Volſcos*, *Æquos*, & *Sabinos*, cum X Legiones eſſent, & in omni Legione 4000 Milites continerentur, Militum numerus 40,000, eſſet, neceſſe eſt. Sub Imperatoribus cum Legiones fere XXX, numero æquabant, Milites, quoties illæ plenæ erant (ducto ſcil. 30 in 6500) 195,000, vel 200,000 plus minus habuere: & additis Sociis, quorum erat æqualis numerus, 400,000. Hæc Imperii fuit *Romani* Magnitudo.

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(51) Analecta ad militiam Romanam. (52) Appianum de Bellis Mithridaticis. (53) Annalium Lib. IV.

Of the Roman *Eagles, by the ſame, to Mr.* Cuper. *n.* 337. *p.* 145.

V. De *Romanorum Aquila* dubitas, utrum Auro Argentove incruſtata fuerit? [*veteres*, inquis, *eam Auream vel Argenteam faciunt totam.*] At, Amicorum optime, quis unquam veterum hoc affirmavit? Scio quidem (eruditiſſime *Cupere)* Te cum *Stewechio* & *Lipſio*, militiæ *Romanæ* ſcientiſſimis, ſtare. Scio *Dionem Cocceium* (1) Ἀετὸς χρυσȣ͂ς, *Arrianum* (2) Ἀετοὶ σέμμαλα χρυσᾶ de *Romanis Aquilis* adhibuiſſe. *Xenophon* etiam, de *Perſis* ſcribens, (nam à *Perſis* Aquilæ ſunt acceptæ) Αετόν τινα χρυσȣ͂ν (3), & ἀετὸς χρυσȣ͂ς (4). Sed longe hæc a ſcopo.

Suggeſtum in Curia, (ſic a *Floro* (5) dicitur) ſive *Sellam* (ut *Suetonius* (6), & *Cicero* (7) eam appellant,) quam Senatus *Julio Cæſari* decrevit, totam ex Auro fieri, vix credibile eſt; verum potius (ut vult (8) *Buchnerus) auratam*, & *multo Auro obductam*. Si quis autem iſthanc opinionem pertinaciter defenſum iverit, *Plutarchum* (9) & *Dionem* (10) habebit adverſarios; a quibus hæc eadem Sella Δίφρος ἐπίχρυσος, i. e. Auro inductus ſive obductus, in ſumma ſui parte inauratus, dicitur: Ut, a *Suetonio* (11) [*Sedes Aurea*] & plus ſemel a *Cicerone* (12) Elegantiarum patre, qua ſignificatione Sella hæc dicatur *Aurea*, facile ſit perceptu. Domum incendio abſumptam, reſtitutamq; *Nero* (ex auratis proculdubio Columnis, oſtiorum poſtibus, Feneſtris, & id genus aliis) *Auream* (13) nominavit, non ex Auro fabricavit.

Notum etiam eſt, a *Cicerone* (14) Aquilam militarem dici *Argenteam*; ſed id ſignificare [*totam eam ex Argento fieri*] non eſt probabile; cum in triumpho *Pompeii* magni, *Mithridatis* Currus [*Aureos, Argenteoſque fuiſſe*] tradit *Plinius* (15). Hoſcine vero totos fuiſſe *Aureos* opinabimur? minime gentium. Ipſa rei ratio contradicit. Quis enim neſcit, Tritum hæc Metalla non pati? Quis neſcit, Auri id pondus eſſe, ut Currus ex eo factus, quod trahi reſpuat, (niſi minutulus, ad Puerorum ludicra) omnino ſit inutilis? *In hujuſmodi dictis, non ſolum verborum ſono, & primo eorum ſenſui, ſed & ipſi naturæ rei conſulendum:* Quæ ſi, in veterum Auctorum interpretatione, diligenter obſervetur Regula, in iis explicandis exponendiſque, uſus erit profecto non exigui.

Hoc quaſi filo ducti, Labyrinthum hunc ingrediamur; primoq; advertamus, *Aquilam* eſſe totius Legionis Inſigne, fulgens, haſtæ longæ extremitati affixum; ut ab Aquilifero erectum, & a militibus, (præcipue primæ Cohortis) ii vero in Legione, ut ex *Vegetio* (16) patet, Pedites mille centum quinque, Equites centum triginta duo (i. e. 1237) erant, aſpectum, uſui ſit tanto eorum numero, in ſervandis ordinibus, in cuſtodiendis intervallis, atq; adeo forma aciei retinenda. Alta ergo, & magna ſit *Aquila*, neceſſe eſt, ut propoſito reſpondeat: Primum ejus Altitudinem, & deinde Magnitudinem indagabimus.

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(1) Lib. XL. (2) Diſſertationibus *Epicteti*. (3) *Xenophon.* Anab. (4) Pædia *Cyri*, Lib. VIII. (5) Lib. II. Cap. XI. (6) De *Julio Cæſare*, Cap. XXVI. (7) Philippic. 11. 85. De Divinatione 1, 19. (8) Theſauro Eruditionis Scholaſticæ, voce *Aureus*. Ed. *Lipſienſi*. 1692. (9) In *Cæſare*. (10) Lib. XLIV. (11) Loco jam citato. (12) Locis jam citatis. (13) Sueton. in *Nerone*, Cap. XXXI. (14) Oratione in *Catilinam*, Cap. IX. (15) Lib. XXXIII. Cap. XII. (16) Lib. II. Cap. VI.

In *Adlocutionibus*, quas Nummi *Romani* paſſim repræſentant, iis præcipue, quæ juſtæ longitudinis haſtam humi defixam habent, & *Aquilam* ad perpendiculum elevatam; his, inquam, in Nummis, *Aquilæ* & Haſtæ, cui imponitur, ſimul ſumptarum altitudo, ad Aquiliferi altitudinem eſſe ſolet, ut 4 ad 3; ſive in ratione ſeſquitertia, præterpropter. Ut in Nummis *Caii Cæſaris*, (17) & *Galbæ*, (quos ex Ære majuſculos poſſideo, & jam nunc in manibus habeo) aliiſq; licet obſervare, *Galbæ* (18), *Hadriani* (19), *Gordianique* (20); quorum figuræ, prelo impreſſæ, extant; & in Nummo *Othonis*, (quem etiam poſſideo) *Securitatem P. R.* exhibente. Dato jam Aquiliferum ſex pedes altum eſſe, (quæ utiq; ſtatura in iſtiuſmodi milite *commoda* cenſeatur) hinc ſequetur, *Aquilam* & Haſtam ſimul acceptas, altas eſſe pedes octo. Hujus altitudinis pars minimum duodecima tribuenda eſt *Aquilæ*, cujus profunditas erit *unciarum octo*. Ex profunditate corporis hujus Aquilini, de ejus cæteris dimenſionibus poſſumus conjicere; & ex iis de ejus *Pondere*. Erit pondus hujuſce *Aquilæ*, ſi ex *Argento* fuerit, librarum circiter 300 *Trojan.* ſi ex *Auro*, 600 *l. Trojan.* At tantæ molis *Auro*, vel etiam *Argento*, Haſtæ ſummæ impoſito, in altum elevando ferendoque parem, quem tandem inveniemus *Aquiliferum?* Profecto, quod in cauſis antiquitus ſolebat dici perobſcuris, *Non liquet.*

Lipſius (21) hic opponit ex *Floro*, in clade *Variana* [*Signiferum* Aquilam *intra Baltei ſui latebras gerentem, & in cruenta palude delitentem*,] ne ſcil. potirentur ea hoſtes; ex eoque corpus *Aquilæ* non magnum eſſe judicat. Balthei latebras, quam velit ille maximas, & quidem ejus, qui vel *Garagantuæ* circundaretur, lubentius concederem, quam Aviculam, Paſſerem, vel Rubellionem magnitudine vix ſuperantem (qualem *Lipſius* eam eſſe vult) *Aquilæ Romanæ* vires & munera præſtare; ſed ut *Florus*, in aliis hujus narrationis partibus, turpiſſime falſus eſt, (qua de re videantur *Ryckii* (22) ad *Tacitum* Animadverſiones;) ita quidem minime audiendus, in ea, qua de *Aquilæ* magnitudine adeo diſſentit, tum a reliquis optimæ notæ Auctoribus, tum ab ipſa rei natura veritateque.

Ego quidem (ut de *Aquilæ* fabrica, ex ejus uſu, ferrem ſententiam) e Ligno quodam, vel Subere, vel materia ſive Coriacea, ſive Chartacea, vel hujuſmodi aliquo levidenſi, Lamina ſive Argentea ſive Aurea obducto, cum Alis ejuſdem Laminæ in altum expanſis, & interdum Tonitru ſub *Aquilæ* pedibus, eam fieri conjecto. Talis enim propoſito reſponderet. Aquilæ parvitati immodicæ non parum favent ea, quæ de Sacello ejus, ab Auctoribus nimis obſcura, neque recte ſatis, exhibentur. Aliqui Sacellum, & in eo *Aquilam*, Haſtæ ſuperponi volunt: Sed (ut apertiſſime (23) *Lipſius) Cave ſentias in Haſta ipſa ſimile quidpiam adfuiſſe Templi.* Ad Caſtra id referendum eſt; in quorum principiis Ædicula quædam, ſive Templum erat, in quo, Religionis ergo, *Aquilæ* & Signa ſervabantur, adorabantur: quod ex *Herodiani* lib. iv. probatur. Hoc autem adjicere placet ὑπέρμετρον, quod a *Lipſio* præ-

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(17) Vide Tab. II. (18) Stewech. Comment. ad lib. III. Vegetij, pag. 271. (19) Ibid. (20) Acta Eruditorum Menſis Maii, MDCXCIII. (21) De Militia *Romana*, lib. IV. (22) Pag. 33. (23) Commentario ad Lib. II. Annalium *Taciti.*

Part IV. Plate II. P. 27.

Fig. 1.

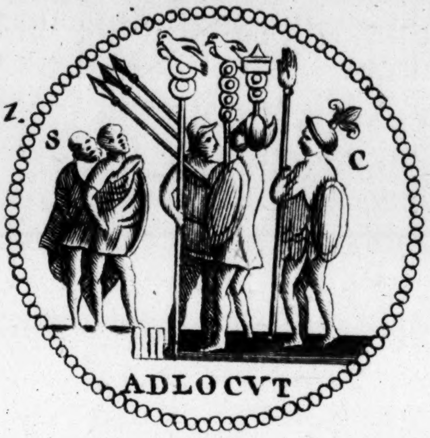

Fig. 2.

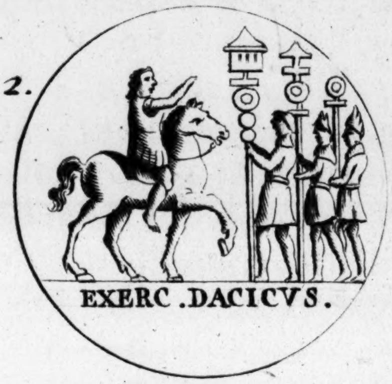
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Fig. 3.

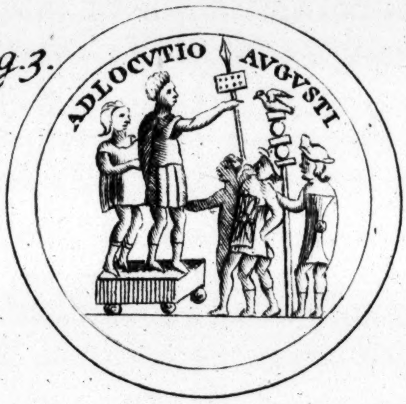

ADLOCVTIO AVGVSTI

Fig. 4.

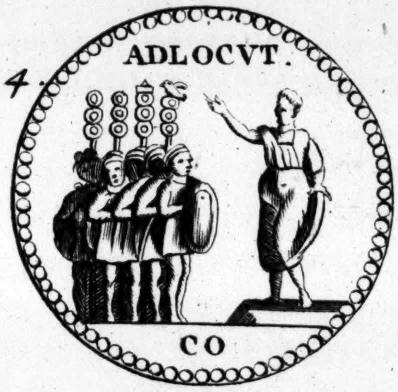


Fig. 5.

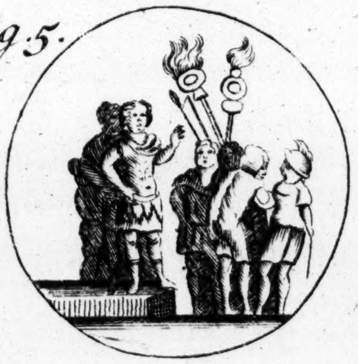
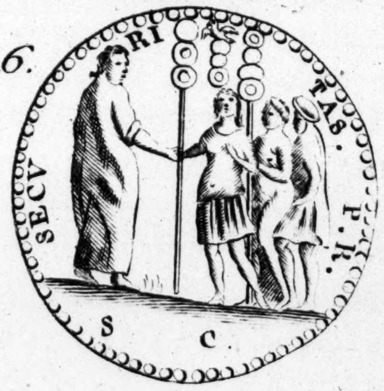


Fig. 6.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termiſſum eſt, nempe ad Domos etiam privatas id referri poſſe videri. Ita enim (24) *Cicero* de *Catilina* [Aquilam Argenteam, *cui domi tuæ* ſacrarium *ſcelerum tuorum conſtitutum fuit.*] Quod ab alijs *Aquilæ Sacellum*, *Templum*, & *Ædicula* fuit, *Sacrarium* id a *Cicerone* dictum, & quidem in privata Domo poſitum.

Hanc rem conſideranti, nemo eam acu tetigiſſe mihi magis videbatur, quam *Ant. Auguſtinus* (25), qui ita ſcribit, [*Legiones ſingulæ* Aquilam *ſculptam geſtabant*, *haſtæq; impoſitam*, Auro Argentove incruſtatam.] Quæ quidem illius verba, rem, ut opinatus ſum, veram exprimentia, in Commentarium meum retuli: rectene vero, an ſecus, cedo quemvis arbitrum.

Tabulæ Explicatio.

I. Nummus *Galbæ*, in altera parte habens ejus Effigiem, cum hac Inſcriptione, IMP. SER. SVLP. GALBA. CÆS. AVG. TR. POT. In altera *Adlocutionem*, quam hic exhibemus. II. Nummus *Hadriani*, cujus alterâ facie, HADRIANVS. AVG. COS. III. P. P. Alterâ hæc *Adlocutio*. III. Nummus *Gordiani:* cujus altero latere, IMP. GORDIANVS. PIVS. FELIX. AVG. altero, quæ hic cernitur, *Adlocutio*. Reliqui tres Nummi e meis ſunt, ærei, ejuſdem Magnitudinis cum Figuris; nempe, IV. Nummus *Cæſaris*; cujus altera pars habet, C. CAESAR. AVG. GERMANICVS. PON M TR PO. (i. e. Pontifex Maximus, Tribunitiæ Poteſtatis.) Altera hanc *Adlocutionem*. V. Nummus alter *Galbæ*; altera parte habens, SER. GALBA. IMP. CAES. AVG. altera, *Adlocutionem*. VI. Nummus *Othonis*, cujus altera facie, IMP. OTHO. CAES. AVG. TR. POT. altera, SECURITAS. P. R.

Notatu dignum eſt, in omnibus hiſce Nummis *Aquilas* ejuſdem fere altitudinis eſſe, nempe tres ſupra caput Aquiliferi circiter pedes; unde licet conjicere, quod tametſi Haſtæ, quibus ſuperimpoſitæ fuerunt *Aquilæ*, non in Nummis omnibus exprimantur, tamen, cum in Nummis 1, 2, 3, 4, integre ad terram uſque producantur, ejuſdem alias cum hiſce longitudinis eſſe.

Strange Bones near Canterbury, *by Mr.* W. Somner. *n.* 272. *p.* 882.

VI. Mr. *John Somner*, in the Month of *September*, 1668. ſinking a Well at a new Houſe of his in *Chartham*, a Village about three Miles from *Canterbury*, towards *Aſhford*, on a ſhelving Ground, or Bank-ſide, within twelve Rods of the River, running from thence to *Canterbury*, and ſo to *Sandwich* Haven; and digging for that purpoſe about ſeventeen Foot deep, through gravelly and chalky Ground, and two Foot into the Springs; there met with, took and turned up a parcel of ſtrange and monſtrous Bones, ſome whole, ſome broken, together with four Teeth, perfect and ſound, but in a manner petrified and turned into Stone; weighing (each Tooth) ſomething above half a-Pound, and almoſt as big (ſome of them) as a Man's Fiſt. Cheek-Teeth, or Grinders, as to the form, they are all, not much unlike, but for the bigneſs, the Grinders of a Man. And whereas I ſaid, *almoſt as big*, *ſome of them*, *as a Man's Fiſt:* It brings to my Remembrance

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(24) Loco jam citato. (25) Dialog. III. Antiquitatum in *Cappadocia*.

what I have read in *Ludovicus Vives*, of ſuch a Tooth, but a little bigger; (*Dens molaris pugno major*, he ſaith; that is, *a Cheek-Tooth, bigger than a Fiſt*) which was ſhewed to him for one of St. *Chriſtopher*'s Teeth, and was kept in a Church that bare his Name; which whether he believed or not, I know not; but contradict it he doth not I am ſure; neither he, nor his learned Companion, whom he doth name there. Juſt ſuch another Tooth *of the bigneſs*, he ſaith, *of an ordinary Fiſt*, was ſeen by *Acoſta*, (a very creditable Author) in the *Indies*, digged out of the Ground, in one of their Houſes there, with many other Bones; which put together, repreſented a Man of a formidable, or as he ſpeaketh, *deformed bigneſs*, or *greatneſs*, as he judged of it. And ſo muſt we have judged of theſe Teeth, and of the Body to which they belonged; had not other Bones been found with them, which could not be Man's Bones. Some that have ſeen them, by the Teeth, and ſome other circumſtances, are of opinion, that they are the Bones of an *Hippopotamus*, or *Equus Fluvialis*, that is, *a River-horſe*; for a *Sea-horſe*, as commonly underſtood and exhibited, is a fictitious thing. Yet *Pliny* makes *Hippopotamum (mari, terræ, amni communem)* to belong to *Sea*, *Land* and *Rivers*. The Earth or Mould about them, and in which they all lay, being like a Sea-earth, or Fulling-earth, not a Stone in it, unleſs you dig three Foot deeper, and then it riſes a perfect Gravel. We have with the help of an able Limner, adventured on a Scheme, or Figure, of ſeveral of the Teeth and Bones, with their reſpective Dimenſions, of breadth, length, and thickneſs.

From a due conſideration of the Place, and the adjacent Country, and other incidental Circumſtances; I am inclin'd to think they belong'd to ſome *Marine* or *Sea-bred* Creature, to which the Land can lay no Claim. The Queſtion is, how it ſhould be found in any Land, and at ſuch a depth under Ground? For Solution whereof, we ſhall diſcourſe on the four following Queries.

1. Whether the Situation and Condition, Face and Figure of the Place may poſſibly admit of the Seas once inſinuating itſelf thither?

2. Whether (that poſſibility being granted, or evinced) the Sea did ever actually inſinuate itſelf ſo far as to this place, and when?

3. How in probability, and when this Valley or Level, being once Sea-land, ſhould come to be ſo quite deſerted and forſaken of the Sea, as it is at this day; the Sea not approaching by ſo many, a dozen Miles, or more.

4. By what means, the Sea once having its play there, this Creature comes to lodge, and be found ſo deep in the Ground, and under ſuch a ſhelving Bank?

As to the firſt (the Places capacity and aptitude for the Sea's influx, or inſinuation) ſuch as know the Situation, withal cannot but know, and muſt agree it to be ſo. As for Strangers, and ſuch as are unacquainted with the Place, for perfecting Information in what either the common Maps, or a particular Scheme and Draught of the Level, herewith intended, may chance to be defective in; they may pleaſe to know, that the Place *(the locus loci)* we are upon, is a Part of that wide, fair and fruitful Level, or Valley, extending itſelf not leſs than twenty Miles in length, between a continued ſeries and range of Hills, Downs, or high Grounds, lying at a pretty diſtance each from other all the Way; beginning at the *Eaſt Kentiſh*-ſhore, and ſtretching itſelf Weſtward, by *Sandwich*, *Fordwich*, *Canterbury*, *Chartham*, *Chilham*, *Godmerſham*, *Wy*, *Aſhford*, ſometime in a direct, ſometime in a winding Courſe, as far at length, as to that famous ſpacious Level of *Romney-marſh*, and is waſhed and watered all along, at leaſt from about *Aſhford*, by a ſweet and pleaſant River running through the midſt of it, as far as to *Sandwich*, and there by the Creek, or Haven, emptying itſelf into the Sea; nothing at all of obſtruction, by the interpoſition of Hills, or high Grounds, hindring or controlling the Sea's free play and paſſage for ſo many Miles together. The Place then, with the Parts, the Tract above and below it, from the Condition, or Conſtitution of it, is plainly not unapt or uncapable of the Sea's Inſinuation and Influence. If any ſhall object, *Canterbury*'s being in the Way, as an Obſtruction or Bar; they are eaſily enough anſwered. For although that City ſeemeth, and indeed is, at this Day, for the moſt Part ſomewhat elevated above the Pitch of the reſt of the Valley or Level we are upon; yet not ſo much as to defend itſelf many times from Floods, and Overflowings in the lower, and moſt depreſſed Parts of it, even by the Springs it ſtands upon, to her great Damage and Annoyance; towards the helping whereof, by the Care and Providence of former Ages, it is very certain, and by digging Wells, Vaults, Cellars and the like, daily experimented, that the moſt Part of the City, not excepting the very Heart and Center of it, is made and raiſed Ground; the Tokens of Foundations upon Foundations, to a very conſiderable Depth, daily appearing, and the Ground (as at *Amſterdam*, *Venice* and elſewhere) for ſupporting Superſtructures, in ſeveral places often ſtuck and ſtuffed with Piles of Wood, or long Poles and Stakes, forced into the Ground, as Wells and Cellar-diggers have inform'd me. Nay, and as if where about now the Bull-ſtake Market-place is kept, the River had ſometime had its Courſe or Current, Pits and otherlike Tanners Utenſils, have, not many Years ſince, been met withal in digging for Cellars thereabouts. To this let me add, that my very next Neighbour in *Caſtle-ſtreet*, within theſe thirty Years ſinking a Cellar, did a good Depth (*five or ſix Foot deep*) light upon, and was put to ſome ſtop and ſtand in his Work, by a ſtrong and well couched arched Piece of *Roman* Tile or Brick, which he was fain to take, or break aſunder, and remove, before he could proceed. Hereof I was an Eye-witneſs, and (for Curioſity ſake) took one of the Bricks or Tiles to my ſelf, which with ſome otherlike *Roman* remains (ſome found in that which is my own Garden) I keep by me to this Day. However then, *Canterbury* may now ſeem to ſtand in the *Æſtuary*'s way; yet time was when in probability it did not; when I mean the Place, the Soil which now the City occupies, as the reſt of the whole Valley both above and below it, was of too low a Pitch, to be an obſtacle to it.

As to the ſecond Enquiry, (whether probably the Sea did ever actually Inſinuate itſelf ſo far as to this Place, and when?) the Anſwer is nothing ſo eaſie: Record of it we have none. The beſt and eldeſt Account we have now of the Condition, Site and Conſtitution of theſe our Eaſtern

Parts and Tract, we owe to *Julius Cæſar*, and the *Romans* after him; from whom (alas) we have not the leaſt Spark of Light to ſuch a Diſcovery; rather indeed the contrary; both the Sea-coaſt, and In-land Parts, by his and their Relation, bearing in a manner one and the ſame Face and Figure then as now. However, that the Level we are upon was ſometime an *Æſtuary*, or Arm of the Sea; ſeveral *Criteria*, or Tokens, are not wanting. For example; beſides what may be argued and inferr'd from this parcel of ſtrange Teeth and Bones now under conſideration; much (as I conceive) there is of probability for it, reſulting from our River's name of *Stoure*, more antiently, not ſeldom both called and written *Æſtur*, *Eſture*, &c. which I doubt not to proceed and come from the Latin *Æſtuarium*, and in proceſs of time to have been corrupted and contracted into *Sture* and *Stoure*; giving name in part to *Stourmouth*, a place (a Pariſh) about ſix miles Eaſtward from *Canterbury*; ſo called from the River's diſemboguing there into the Sea, or Salt-water, flowing up thither; as alſo giving name to that Mannor of the Archbiſhop's, at this day, and for ſome Ages paſt called *Weſtgate-Court*, at *Canterbury*; but more anciently, as in the Conqueror's time (witneſs *Domeſday*-book) called the Mannor of *Eſture* and *Eſtureſate*, from its ſituation by the *Sture* or *Stoure*. From which occaſion doubtleſs, the late Lord *Finch*'s Seat in —— about five or ſix Miles nearer to the Spring head, at this day vulgarly miſcalled *Eaſt-ſteward*, is of old ſometime called *Eſture*, ſometime *Etſture*. From *Saxon* Monuments and Records I could eaſily trace the name up to a very high date, by many examples.

But to leave that, and proceed to other *Criteria*; as by the Teeth and Bones now under conſideration, we have an inſtance on that ſide of the Valley for the probability of the Sea's *quondam* occupation of it; ſo I ſhall give you here another no leſs remarkable from the other, or oppoſite ſide of it. By credible relation and aſſurance then you may know, that a place called *Weſtbere*, an obſcure Village about three miles from *Canterbury*, Eaſtward, lying under the brow of the Hill ſtretching out by *Upſtreete*, as far as to the Weſt end of *Sarr-wall*, by which you make your entrance into *Thanet*; upon the like occaſion to that here at *Chartham*, (the digging, or ſinking of a Well) at a very great depth, ſtore of Oyſters and otherlike ſhells, together with an Iron Anchor, firm and unimpaired, were found and turned up in our time. The like I have been told of an Anchor in our days digged up at *Broomedowne*, on the ſame ſide of the the Level ſomewhat above *Canterbury*, Weſtward.

Let us now come to our third Query, and ſee if happily ſomewhat may not thence reſult adminicular and ſuppletory to what may be defective and wanting in the former. Our third Query now is, how in probability, and when this Valley or Level, being once Sea-land, ſhould come to be ſo quite deſerted, and forſaken of the Sea, as it is at this day, the Sea not approaching it by ſo many, a dozen miles, or more? In anſwer whereof, I muſt needs ſay and grant, that in caſe this Level were once Sea, an *Æſtuary* I mean, or Arm of it; ſo very long it was ago, as we may not reaſonably think, that *Canterbury* (whether as a City, or never ſo mean a *Pagus* or

Village) was then *in rerum natura*, or a place inhabited; which happily it may have been if not as long as *Julius Cæſar*'s days, yet undoubtedly not long after. For an account we have of it (as of ſome other places in *Kent)* in the *Romans* time, both from *Ptolemy* the Geographer, *Antoninus Itinerary*, and elſewhere. Now (as was hinted e'rewhile) elder Records either of *Kent*, or of *Britain* that we may confide in as Authentick, we have none that I know of before the *Romans* time: no written credible evidences to help us in this Scrutiny. We muſt therefore either ſit us down, and reſt contented to throw off all farther enquiry, or elſe caſt about for information as we can. Such as are for this latter will tell you, that the World (all know) is very aged, many thouſand Years old, and that many and manifold are the alterations, changes and mutations, which time hath made in ſeveral parts and quarters of the World; to the notice and diſcovery whereof no written Record, or unwritten Tradition at this day, can reach or direct us: Tradition it ſelf (longer liv'd many times than any written evidence) failing us for age. Of ſuch a nature they conceive may this of the *Æſtuary* be, ſo very ancient, as time hath quite worn out the memory of it; withdrawn all light from us, that might conduct us in the ſcrutiny, and left us as Men in the dark, without either *vola* or *veſtigium* to ſtumble out our Way, and rome and ramble at uncertainties. Such a one happily ſhall he be thought, that adventuring to conjecture at the reaſon and occaſion of the Sea's receſs here, with an abſolute valediction to the place of its wonted reſort, ſhall pitch upon the Seas breaking, burſting and cleaving aſunder that *Iſthmus*, or neck of Land, between *Gaul* and *Britain*, rendring the latter of the ſame Continent with the former; ſuch things ('tis certain) have hapned elſewhere. Thus (ſaith *Seneca*) hath the Sea rent *Spain* from the Continent of *Africk*. Thus (as he adds) by *Deucalion*'s flood, was *Sicily* cut from *Italy*. More inſtances of this kind may be found in Mr. *Camden*'s *Cantium*, and elſewhere. And although there be no certain evidence of ſuch an accident here from ancient either Hiſtorians or Geographers; yet is the thing ſo ſtrongly and rationally argued, by him eſpecially, as by *Verſtegan* alſo, *Twine* and others before him; and the conjecture back'd with ſuch plenty and probable *Criteria*, by the former; that what others may think I know not; but were I of the Jury, I ſhould more than incline to concur with them, who find for the *Iſthmus*. Eſpecially, when to the plenty of Arguments muſtered up by Mr. *Cambden*, I ſhall have contributed this one, by him and the reſt omitted, which is, that by a received conſtant Tradition, *Romney-Marſh*, that large and ſpacious Level, containing (ſaith Mr. *Camden)* 14 Miles in length, and eight in breadth, was ſometime Sea-land, lying wholly under Salt-water, and is therefore of ſome not improperly called the Sea's gift; which having (when time was) forſaken it, and withdrawn his wonted influence from it; the place thereupon became and continues firm Land. And if I may gueſs at the time and occaſion of both that, and our *Canterbury* Levels recovery and riddance from Sea, I ſhall (for my part with ſubmiſſion to better judgments) be apt to pitch upon that of the Sea's breaking through, and in time working and waſhing away that *Iſthmus* between Us and *France*. And then whereas beforetime

time *Romney* Level (which had and hath its *Stoures* too, or *Æſtuaria* as well as ours) and this other not improbably (no high Lands as we ſee, interpoſing for impeding their conjunction) were but one and the ſame Level, and lay under the Sea's and Salt water's tyranny; now both the one and the other (the Sea having ſo much play and elbow room, than formerly by cleaving aſunder the *Iſthmus*) were reſcued from it, and of an *Æſtuary*, became ſuch a rich and noble Valley or Level, as is ſecond to none (I take it) in *England*.

To come at length to the fourth and laſt of our Queries, by what means the Sea once having its play there (at *Chartham*) this Creature comes to lye and be found ſo deep in the Ground, and under ſuch a ſhelving Bank? My anſwer is, that ſuppoſing this with the reſt of the Level or Valley once occupied by the Sea or Salt-water, that being a Creature which by fluxes and refluxes always is in motion, and thereby in time beating upon, and working itſelf into the bank, or riſing ground there, might at length ſo far undermine, eat into, and looſen it, as to fetch down ſo much Mould or Earth upon, or over the place, as to lodge the Creature at ſo great a depth. Or elſe perhaps, the continual agitation of the Water, might in time force, drive up, and caſt over it, that great quantity of Ouſe, Earth and other matter under which it lay. By the way, it is obſerved that the nature of the Soil here and there, is ſuch, ſo looſe, ſupple, rotten and ſandy, that merely of itſelf, it is apt to ſink and fall in; as was lately experienced by a Saw-pit, digg'd hard by, which after a little time by the Earth's giving way on each ſide of it, fell in, and fill'd up itſelf *.

2. It ſeems to me, that theſe Teeth and Bones mention'd by Mr. *Somner*, might have been the Teeth and Bones of ſome Elephant, rather than of the *Hippopotamus*: and that,

Firſt, in reſpect of the place; for, as Mr. *Camden* ſays † ſpeaking of *Chilham* in *Kent*, of which this *Chartham* is a neighbouring Village, ſituate in the ſame Down, and on the ſame River *Stowr*, that it is a current report amongſt the Inhabitants that *Julius Cæſar* encampt there, in his ſecond Expedition againſt the *Britains*; and thence it was called *Julham*, as if one ſhould ſay, *Julius* Station or Houſe. It appears further, ‡ that *Rhatupiæ* (which whether *Richborough* or *Stoner* matters not) ſituate near the preſent *Sandwich*, was the place of *Claudius* his Landing in *Britain*; and that through this Down was his neareſt paſſage to the *Thames* (is indiſputable) whither he was going: So that 'tis highly probable, that during the ſtay, paſſing or repaſſing of theſe *Roman* Armies through theſe Downs, ſome one of their Elephants might periſh or dye, and be buried there.

Secondly, By the Teeth themſelves, for if you compare the Icons given by Mr. *Somner*, with the Deſcriptions of Dr. *Mullins* * you will find them the very ſame, as to breadth and depth, *&c.* and their being *Molares*; for, ſays the Dr, theſe eight (which were all the Elephant had beſides the two Tuſhes) were *Molares*, for he had no *Inciſores*.

Thirdly and laſtly, to ſolve that great difficulty (which obliged this Gentleman to imagine this Down to have been an Æſtuary, that his *Hip-*

* *See Fig.* 1.

Remarks by Mr. Luffkin. *n.* 274. *p.* 925.

† Britannia. p. 197.

‡ *Ib. p.* 208.

* *Anatomy of an Elephant. p.* 40.

Plate III. Part IV. P. 32.

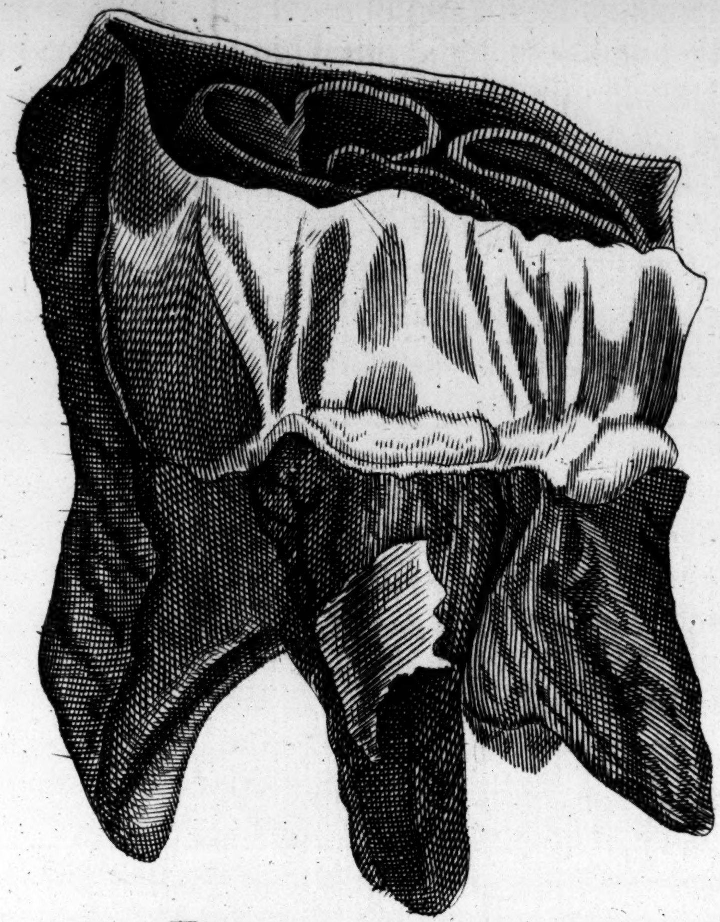
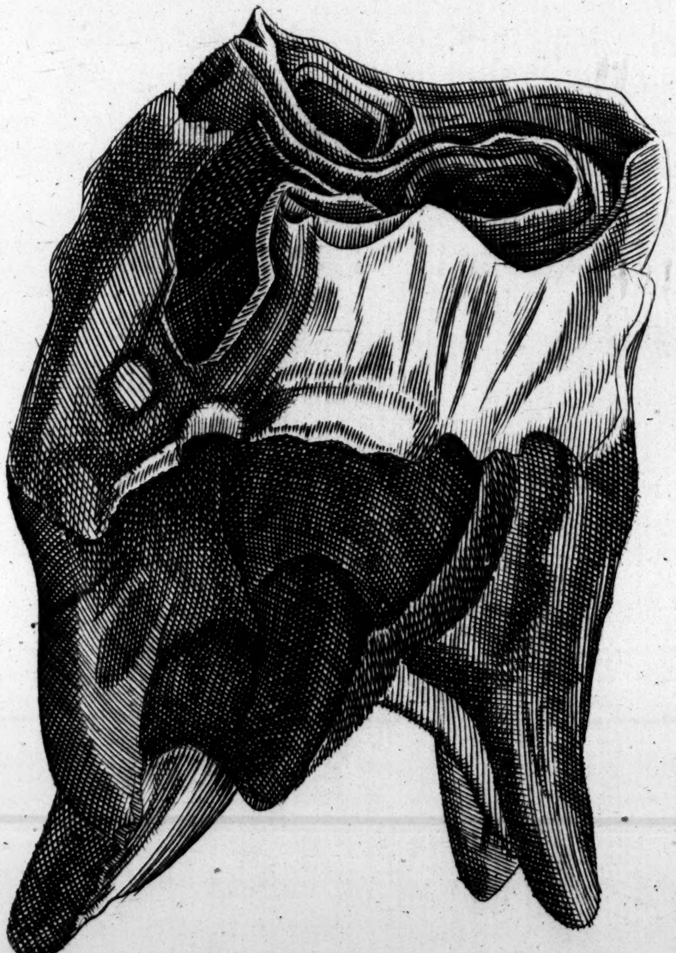


Fig. 1.



popotamus might therein dig its ſelf a Grave, otherwiſe how ſhould theſe Bones be found at ſuch a depth? For who with reaſon (ſays Mr. *Somner*) can imagine, that any Land Creature could ever have had (at firſt) ſo deep a burial? But 'tis eaſily explained why theſe Bones ſhould at this day be found at ſuch depths, if we conſider the Alteration or riſing of the Valleys, by the continual waſhing down of the looſe Earth or Soil by the Rains and Snows from the adjacent Hills, and by the annual rollings of the Graſs, Sedge, *&c.* growing upon it: For proof of which take the following inſtance from * Dr. *Plott's Staffordſhire*, ſpeaking of a Moſs, *&c.* wherein there was found a Lump of Coins of *Edward* IV. of *England* (ſuppoſed to be loſt in a Purſe or Cloath, now rotted away) at 18 Foot deep, which being about 200 years ſince (that is, when they were found) whoever pleaſes to compute it, will find this Moſs grew about one Foot in 11 Years, or one Inch *per annum*, and $\frac{1}{12}$ *proxime*. Now it will be eaſily granted, that if this Moſs grew or advanced itſelf above its former ſurface 18 Foot in 200 Years, then this Vale or Down might advance itſelf 17 Foot in almoſt 1700 Years.

Of the Iſthmus *between* Dover *and* Calais, *by* Dr. Wallis. n. 275. p. 967.

VII. 1. I think it not amiſs, to enforce this Argument, by conſidering, what muſt have been if this Hypotheſis be true, and how it agrees with what we ſee an *Iſthmus* had once been, where now is the Paſs between *Dover* and *Calais*; the Great Seas, on both ſides, muſt continually beat upon it, with a fierce impetuous Tide, twice in four and twenty Hours. The *Northern* Sea, between us and *Holland* (called *Oceanus Germanicus*) on the *Eaſtern* ſide: And the *Weſtern* Sea, between us and *France*, (called *Oceanus Britannicus*) on the *Weſtern* ſide. Which (in proceſs of time) may well be ſuppoſed likely enough to wear away, or break thro' a narrow *Iſthmus*. The *Weſtern* Tide coming in fiercely between us and *France*, fretting on the Coaſt on both ſides, muſt needs be ſuppoſed to bring with it a great deal of Earth, Sand, or Mud. But, being ſtopp'd in its Current by this *Iſthmus*, did not depoſite it (as might be thought) on the ſide of it, (which might ſtrengthen it,) but found an opportunity of diſcharging itſelf on the ſpacious Level of *Romney*-Marſh; (which, as *Cambden* tells us, is *fourteen Miles in Length, and eight in Breadth*;) fretting that *Iſthmus* as it comes along; and then (at ſtanding Water, about the Tides receſs,) letting it fall on that Level, and lodging it there: But then again, fretting that *Iſthmus*, and the Coaſt all along, as the Tide returns, with a like force as it came in. Which gives us a fair account, both how that *Iſthmus* might be waſhed away, and how that Level might be raiſed to that height it now is. For no man can doubt (who doth well know the Situation of the Place, and the Nature of the Soil) but that all that Level had heretofore been Sea. And even at this day, it lies ſo much lower than the Surface of the Sea at High-Water, that it would (much of it) be overflowed every Tide, if not defended (at a vaſt Charge) by *Dim-church* Wall, for many Miles together. Whether it had a like opportunity of ſuch an In-draught (and in what proportion) on the *French* Coaſt, I cannot tell. But, that this is the condition of *Romney*-Marſh, no Man doubts.

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* Chap. vi. p. 48. p. 220. Chap. iii. p. 11, 12. Chap. vi. p. 45, 46, 47, 48.

The *Northern* Sea, (between us and *Holland*) muſt, in like manner, have beat on the *Eaſt* ſide of that *Iſthmus*, with a like impetuous Tide, twice in four and twenty Hours. But, being there ſtopp'd in its courſe, would have the like opportunity of diſcharging it ſelf on the Coaſt of *Holland*, (as the *Weſtern* Sea on *Romney*-Marſh.) Whence it is that *Holland* and *Zealand*, which (by the conſent of all) is judged to have been once Sea, is now raiſed, thirty or forty Foot higher than it had once been. And the ſame *Northern* Sea, which (on this account) hath ſo large an Inlet (Eaſtward) on the Coaſt of *Holland*; would (Weſtward) inſinuate it ſelf likewiſe on the *Engliſh* Coaſt, wherever it might find low Grounds. Which is the caſe of this large Valley, where now runs the River *Sture*, *Stoure*, or *Eſture*; (which name it is ſuppoſed to have taken from the Corruption of *Æſtuarium*,) for more than twenty Miles, (and nothing appears why we ſhould think it had not ſo done,) entering at the low Grounds near *Sandwich* (cloſe by that *Iſthmus*) and running up that Level (by *Canterbury*, *Chartham*, *Chilham*, and ſo forth) as far as *Aſhford* or further. Which Valley had once been much deeper than now it is. For it ſeems, that even at *Chartham* (which is now twelve Miles from the Sea) the Ground is raiſed at leaſt ſeventeen Foot, and the Soil, at that depth, found to be of a like condition, as where the Sea is known to have been; and nearer to the Sea, it may well be preſumed to have been yet deeper. Which is confirmed by the Reliques of this Marine Animal there found, and by Anchors, and Shells of Fiſhes, found elſewhere in the Borders of this Valley, at a great depth under Ground.

Now, that the Sea may thus raiſe the Ground on ſuch In-draughts, by Sand, Earth and Mud, brought in and lodged there at every Tide, is not at all unlikely; for we ſee the ſame at this day. Particularly, in the Iſle of *Oxney* (near adjoining to *Romney*-Marſh) there was a low Level, oft in danger of being overflowed by the River *Rother*. But ſomewhat more than threeſcore Years ago, the Sea being let in, hath raiſed that Level very conſiderably, by bringing in, and lodging there, a conſiderable deal of Earth and Mud every Tide. But withal, it hath ſo fretted the Chanel by which it enters and goes out again, that the Chanel by *Rye*, which (within my Memory) was ſo ſhallow near (what was called) *Kent* Bridge, that Men and Women were wont to ride thro' it: But now (by the Tides entering and returning) that Bridge is long ſince ſwallowed up, and the Chanel become ſo broad and deep, that a Veſſel of good Burden might ride there at Anchor. A fit reſemblance of the Seas fretting this *Iſthmus*, and filling up the *Æſtuaries* on both ſides of it. The like, in good meaſure, is to be ſeen at (what they call) the *Dogger Sands*, which is a Bank of Sands, lying (obliquely) from about the Coaſt of *Norfolk* (if I do not miſtake) toward the Coaſt of *Zealand*, or *North* part of *Holland*. Which is the place where the *Northern* and *Weſtern* Tides (ſince the Rupture of the *Iſthmus*) do now meet, and do there (at ſtill-water, for about an Hour, or at the turning of the Tide) depoſite the Mud and Sand, which (by their rapid motion) is both ways brought thither. Which is ſuppoſed to be the true cauſe of that Sandy

Bank. Whether this, in tract of time, may there form a new *Iſthmus*, (if the World laſt long enough) I cannot ſay. But I am apt to think that the former *Iſthmus*, (if the Tides had ſtopp'd there, and had not found thoſe In-draughts, on which to lodge what it waſhed from thence) might have continued, and been more ſtrengthen'd, by what (upon the Return of the Tide) would daily be lodged there. And upon this account (I think) it is, that the *Iſthmus* at *Corinth*, tho' beat upon by the two Seas (which give it the name of *Bimaris Corinthus*) is not thereby deſtroyed, becauſe there are not ſuch Tides to waſh it away; nor ſuch In-draughts, on which to lodge what ſhould be waſhed from thence.

But the caſe is much otherwiſe with this *Iſthmus* of ours: Where are all things to countenance this *Hypotheſis*. The ſteep Clifts at *Dover*, and thoſe at *Calais*, anſwering directly the one to the other; and appearing to view, as if, that between them, had been violently torn away. And the Sea between them (even at this day) being much ſhallower at that Place than on either ſide of it (as *Cambden* doth well obſerve,) which are ſtrong Preſumptions, that there had been formerly ſuch a conjunction.

The greateſt doubt in this caſe is, that there is no Hiſtory extant (that I know) which takes notice of ſuch an *Iſthmus*, or ſuch a *Rupture*, in this place, which being a thing remarkable, might have been thought worthy to be reported. Which yet need not be thought very ſtrange, conſidering that we have no particular account of the *Britiſh* Coaſt (which might determine this Queſtion) older than the *Romans* acceſs hither with *Julius Cæſar*: Whereas this might have hapned many hundreds of Years before that time, when tho' the Iſland might be known, yet not the particular Coaſtings of it to the *Greeks* or *Latins*. But I have this further to ſay. *Plato* * tells us a ſtory (as of a thing which had hapned ſome Ages before his time, and which at that time was in a manner generally forgotten) of an Iſland ſomewhere in the *Atlantick* Ocean, which by a Deluge and Earthquake (in the ſpace of a Night and Day) was deſtroyed, and ſwallowed up by the Sea; whereby that Sea (formerly Navigable) was for ſometime become unnavigable or unſafe, by reaſon of the Mud and Reliques of that abſorpt Iſland. Which ſeems to me very applicable to the Rupture of this *Iſthmus*: Whereby this Iſland was not indeed wholly deſtroyed; but was broken off from the Continent, to which it was before united. And, upon ſuch an accident, the Sea muſt needs be diſturbed, and put out of its courſe, and rendred unſafe for paſſage, before it came again to be ſettled. For, tho' the firſt Breach might be made in the ſpace of one Night and Day, we cannot ſuppoſe the whole Bulk of it, when once broken, was preſently carried ſmooth away; but firſt the top and upper part of it (in a Day and Night's time) and afterwards the lower parts of it by degrees. Which would render that Sea, if not quite unpaſſable, at leaſt troubleſome and unſafe.

* Ed. H. Steph. p. 25.

And if in ſome circumſtance, this Narration chance to differ from the matter of Fact, as calling the *Rupture* of this *Iſthmus*, the *Subverſion* of an *Iſland*, this muſt be allowed in the Narrative of an old Tradition from hand to hand; for as ſuch it is there brought in. For *Plato* doth there introduce

Critias (then an ancient Man) telling a Story, which (when a Boy ten Years old) he had heard from his Grandfather (who was ninety Years of Age) of what *Solon* (long ſince dead) had told him; namely, that an *Ægyptian* Prieſt had (long before) told *Solon*, that it did appear from ſome old *Ægyptian* Records (of which the *Greeks* had no knowledge) that ſuch a thing had hapned, in an Age ſo long before, as in compariſon of which *the Greeks were but as Children.* And all this Tradition (thro' ſo many hands, and at ſuch great intervals of time) is, at every ſtep, reported from the Relator's preſent memory. And 'tis very poſſible, that ſome one or other of theſe Relators might ſo far miſtake, or miſremember, as to call that a *Diſſolution* or *Diſappearance* of an Iſland (ἠφανίσθη,) which was but a *Tearing of it from the Continent.* It ſerves however to the preſent purpoſe, if at leaſt ſo much of the Story be true, *That long before* Plato*'s Time, there had been ſome ſuch Diſſolution or Rupture of an Iſle or Iſthmus, ſomewhere in the* Atlantick *Ocean*, (that is, in the *Northern* Sea) *of which there were ſome ſymptoms yet remaining in* Plato's *Time.* For, this being admitted, it is as applicable to the preſent caſe (as to any we know) of which there are ſo many Symptoms yet remaining to this day.

* Atlantica. Chap. vii. §. 8. p. 293.

I know, that *Olaus* * *Rudbeck* doth endeavour (in favour of his *Sueonia*) to put an allegorical Senſe upon this whole Paſſage. But I ſee not why it may not be underſtood in a plain literal ſenſe, as a true matter of Fact, (tho' perhaps a little diſguiſed, as was wont to be the faſhion in that Age in relating old Stories;) and is very conſiſtent with all that *Rudbeck* cites out of *Plato*, in that whole ſeventh Chapter of his *Atlantica.* For the name of the *Atlantick* Sea (wherein this Iſland is ſaid to be) was not then (nor is now) confined to the Coaſt of *Sweden*, but extended as far as the *Britiſh* Iſland, and much farther. And when *Rudbeck* tells us out of *Plato*, that the whole *Atlantica* was as big as *Libya* and *Aſia* (which whether meant of *either of them* ſingly as *Rudbeck* underſtands it, or of *both together*, as the Words ſeem to import, ἅμα Λιβύας ἢ Ἀσίας μείζων, I will not contend;) we cannot ſuppoſe it to be *Plato*'s Meaning, that this *whole Region* was ſwallowed up; but rather ſome ſmall part of it, from whence perhaps the whole might take its Denomination. And tho' he tells us (from another Writer) that it was *five Days Voyage* from the *Britiſh* Iſland, to (that part of) his *Atlantica*, where for *thirty Days together the Sun doth not ſet*; this hinders not but that the *Britiſh* Iſlands may be part of the *Atlantick* Region, tho' ſo far diſtant from the utmoſt *Northern* Cape of it.

This Author tells us, that this *Æſtuary* (from *Sandwich* to *Aſhford*) might perhaps flow ſo much further, as to meet with that *Æſtuary* on *Romney Marſh*, and (both being conjoyned) become *one Level.* There is, I think, about three or four miles diſtance, between *Aſhford* and the neareſt part of *Romney Marſh*. How the intermediate Lands be qualified, I do not well remember: But, if this be admitted, that the two *Æſtuaries* (that of *Stoure* and that of *Romney Marſh*) in former times may thus have met: This opens a new Scheme, of which before we were not aware. For then we muſt ſay, that the two Tydes (that from the North and that from the Weſt) which now meet at the *Dogger Sands*, did then meet at the confluence of theſe two *Æſtuaries*. And then (as was but now ſaid of the *Dogger Sands*) bringing (on both ſides) Earth, Mud and Sand to this place, and lodging it there; might firſt form an *Iſthmus* there, and (by degrees) fill up thoſe *Æſtuaries* on both ſides. Mean while, waſhing away that *Iſthmus* between *Dover* and *Calais*, and opening a new paſſage as now it is. There be many other *Æſtuaries* in *England*, where the Sea now enters a great way into the Land; and, how far it might have entered further in former times, who can tell? As that Sea by *Briſtol* between *Wales* and *Cornwall:* That of the *Humber* between *Yorkſhire* and *Lincolnſhire:* And we may reaſonably think, that the *Waſhes* and the *Fenns* in *Lincolnſhire* may have heretofore been Sea, or overflowed by the Sea at High Tydes: And that of the *Thames* (between *Kent* and *Eſſex*;) which now flows (above *London* and *Brentford)* within a mile of *Kingſton* (at Spring-Tydes;) it may perhaps ſeem too daring, to think it may formerly have flowed as far as *Oxford* (between *Shot-over* Hill and *Foxcomb* Hill) and ſo onward toward *Wallingford* (in the *Romans* time called *Galena*;) but there is this to countenance it, that (if I be not much miſ-informed) there be frequently found (in our Stone-Quarries and Gravel-Pits) about *Oxford*, Fiſh Shells, and even the Bodies of Fiſh Petrified, at great depths under Ground. And there have been (no doubt) and now are (in *England)* many other Æſtuaries, Creeks or Arms of the Sea (entering a great way within Land,) ſome whereof may be (in a manner) filled up, and become firm Land; others much narrower, ſhallower and ſhorter, than in former times they have been. For it is the nature of *Æſtuaries*, where the Tydes flow in, to leave behind them, at their Return, much of Mud Oaſe or Sleech (as they call it,) which doth in time come to be firm Land.

At *Hythe* in *Kent* (which is one of the *Cinque Ports)* there was (in our Fathers time) a Convenient Harbour for ſmall Veſſels; which is now ſwarved up. Several attempts have been made to recover the Harbour, but with ſmall ſucceſs. For when (with great Labour and Charge) they have (in ſome meaſure) opened it, it hath ſoon been filled up again, by what the Sea caſts up. And whoever conſiders the vaſt quantity of (what they call) *Beach* (that is, a vaſt multitude of ſmall looſe Stones and Fiſh-ſhells, caſt up by the Sea at *Hythe*, *Lyd*, and elſewhere on the Coaſt of *Romney Marſh*, (for divers miles in Length and Breadth, and to a great depth,) will not think it ſtrange, that a *Creek* or *Æſtuary* ſhould come in time to be filled up and become firm Land. And in many places of this *Beachy* ground, where (within the memory of perſons now living) nothing was to be ſeen but ſuch looſe Stones and Shells (to a great depth,) it comes (by degrees) to be covered with Earth, and becomes Paſture Ground. On the contrary, that what was formerly Firm-land, may be ſo deſtroyed or waſhed away, as to become Sea, is evident from (what they call) the *Goodwin-Sands*, on the Coaſt of *Kent* which is ſaid to have been the Lands of Earl *Goodwin*; but loſt by an Inundation about the time that *Tenterden* Steeple was built, (which gave occaſion to that Ironical Proverb of things contemporary, that *Tenterden Steeple was the cauſe of* Goodwin *Sands*.) The occaſion of ſuch different effects, depending on the different ſituation of the Shores and the ſetting of the Tydes; ſo as to waſh off from one place what it lodgeth on another.

n. 276. p. 1022. I obſerve, that the River in *Eſſex*, and that in *Kent*, (near which the Bones were found,) are (both of them) named the *Stowr*. Which, whether it be a corruption of the Latin *Æſtuarium* (as Mr. *Somner* conjectures;) or, of the Britiſh *ys-dwr* (that is, *the Water*,) I will not diſpute. And, That the Bones were found (in both places) much at the *ſame Depth*, (about 16 or 17 foot under the ſurface of the Earth;) which therefore may (probably) have been lodged (in both places) much about the ſame Time: And, perhaps, when the Emperor *Claudius* brought his *Elephants* into *Kent* and *Eſſex*; as Mr. *Luffkin* intimates out of *Dio Caſſius*.

I obſerve alſo, that thoſe Petrified Bones, in both places, were found in *Gravelly grounds*, (as are thoſe Petrified Shells, and Bodies of Fiſhes, in Gravel Pits and Stone Quarries, near *Oxford*.) How far the Steams, Fumes, or Fluors of the Earth, which contribute to the formation of Stone or Gravel, may conduce to the Petrifying of theſe Bones, Shells, or other Bodies; I leave to the conſideration of inquiſitive Naturaliſts. And, Whether the Impregnation of ſuch *Steams*, may not *Swell* ſuch Petrified Bodies, to a larger Proportion than before they had. Like as we obſerve Wood (and other like Materials) in a Moiſt Air, to Swell; by the Diſtention of their Pores, upon the intromiſſion of Moiſt Particles. For I take all Petrifactions to be made, either by *Incruſtation*, or *Intromiſſion* of Stony Particles.

And I well remember, that (many years ago) at *Moldaſh* in *Kent*, (not far from *Feverſham*) on ſome High Grounds, and very Stony, (which uſed to be ſometimes Paſture, and ſometimes Plowed,) I have obſerved divers *Oiſter ſhells* (Petrified, or partly ſo,) much Larger and Thicker, than the ordinary Proportion of Oiſters in thoſe Parts, and very weighty; which Oiſter-ſhells might have been purpoſely thrown there long before, as being reputed a good Manure for Land; and might have been there Impregnated with like *Halitus*, *Effluvia*, as are the Numerous Stones on thoſe Lands. I have known the Inhabitants, heretofore, have uſed to cauſe the Stones, in thoſe Lands (becauſe they are very numerous) to be gathered up, and carried off the Lands, by Cart-loads, to make more room for the Graſs to grow. But of later years, they forbear (I have been told) ſo to do, as thinking the Warmth (or ſomewhat equivalent) of thoſe Stones, is rather an Help than Hinderance, of the Earth's Fertility. Of which, I ſhall not adventure to deliver an Opinion; but refer it to further conſideration.

But I ſee not why we may not think, the *Stowr* in *Eſſex*, and the *Stowr* in *Kent*, to have been (both of them) *Æſtuaries* of the *Northern Tide*; before the Rupture of that *Iſthmus* between *Dover* and *Calais*: (And the like of the River near *Malden*, and other ſmall Creeks on the Coaſt.) Though not ſo Great as thoſe of *Humber* and the *Thames*: (which were then Æſtuaries of the ſame Sea:) as are many others on the Coaſt of *Scotland*. I ſay, *Before that Rupture*: For ſince that Rupture, the caſe (as to the *Thames*) is ſomewhat alter'd. For the Weſtern Tide (between Us and *France*) which was then ſtopp'd at this *Iſthmus*, doth now flow on (thro' that *Fretum*) beyond the Mouth of the *Thames*, (as high as the *Dogger Sands*;) which doth therefore ſupply the Æſtuary of the *Thames*, which was formerly furniſhed from the *Northern* Sea. And theſe ſmaller Æſtuaries might ſooner be ſwarved up (by what every Tide lodgeth there) while thoſe Greater Æſtuaries, are but ſhortned, and become narrower, than they had formerly been. And as to the *Thames* in particular, it ſeems very evident (if we conſider their Situation, and the Nature of their Soil,) that much of the Low Grounds (in *Kent* and *Eſſex*) on both ſides of the Mouth of the *Thames* (adjacent to the Sea) had formerly been Sea, (as well as that of *Romney* Marſh.) And when the Mouth of the *Thames* was ſo much wider, no doubt but it flowed much further than now it doth. And, how far, who can tell?

It may perhaps be objected, that the ſmall Rivers now remaining, in the bottom of theſe Vallies, which may have been ſuppoſed (in former times) to have been Æſtuaries; do now run more Wriggling (with more Turnings and Windings) than do theſe Vallies. But this need not at all to ſeem ſtrange, when as we may daily ſee the ſame, in the bottom of a Muddy Ditch (or Water-courſe) when the Water is almoſt drained off, the Mud yet remaining ſoft: the little Water, yet remaining, will work out of it ſelf (amidſt the Mud) a Wriggling paſſage (according as the Mud will more or leſs give way) much more Crooked than was ſuch Ditch when full of Water. And the like muſt needs happen in the (gradual) Draining of ſuch Æſtuaries, according as the (ſoft) Earth will permit. Which Crookedneſs will continue, when the Banks on both ſides do (by degrees) grow firmer.

As to what I ſay concerning the Iſle of *Oxney*; I take it to be thus. If we look in the more Ancient Maps of *Kent* (older than the Year 1640) you will find, that (what we call) the *Iſle of Oxney*, was then but a *Peninſula*; being (by a ſmall *Iſthmus* or neck of Land at the North-Eaſt corner of it) continued to the reſt of the Country: And the Tide from *Rye* to that place (which now flows ſtraight onward on the North ſide of the Iſle) was there ſtopp'd by that *Iſthmus*, and did wheel about on the South ſide of it: Or rather the River *Rother*, did (from the North ſide of the Iſland) wheel about by the South ſide (to that Eaſtern corner) and thence (by the Chanel) to *Rye*. While things were in this ſtate; divers Mooriſh or Marſh-lands, adjoining to the River *Rother*, were oft in danger (upon great Rains) to be Drowned. But ſo it once hapned (by what accident I know not) that this Drowned Land had unexpectedly (in a Night's time, or little more) diſcharged itſelf on another Level, ſomewhat lower than itſelf. Upon which Indication, it was thought Adviſable (by cutting that *Iſthmus*) to allow thoſe Waters (on the North ſide of the Iſland) a ſtraighter paſſage toward *Rye*; and to let thoſe Lower Grounds (for ſome time) to lie under Water (paying the Rent of them) till ſuch time as (by intromitting the Tide) they might be ſomewhat heightned; and then timely recover'd.

Of the ſame by Dr. Muſgrave. n. 352. p. 589.

2. Poſita Cherſoneſo *Britannica*, utrum excedi potuerit: Deinde, utrum exeſa fuerit, ediſſeram.

De priori propterea dicendum, quod à *Voſſiorum* altero, ſtrenue negatum ſit, unquam, ubi hodie Fretum eſt, fuiſſe Cherſoneſum: & quidem ideo negatum, quoniam, illo ſentiente, nihil ei deterendæ dividendæque par inveniatur. Ut *Taprobanam* (Inſulam *Ceylon*) à vicina continente non avelli probet Vir Clariſſ. [*Otio* (a), inquit, *abundant, qui iſtiuſmodi* Ægyptiorum *fabelli, jam millies productis, totieſque recoctis, aurem commodant. Quam conſtans & tenoris ſui obſervans ſit rerum natura, patet è Boſphoris, omnibuſque omnium terrarum Fretis: Iis cum præcipue Marium & ipſius Oceani vis ſemper incubuerit, eadem tamen ubique à tot annorum millibus & ab ipſo, ut veriſimile eſt, rerum exordio, ſervaret intervalla. Currant licet, ac recurrant Undæ, allatrent undequaque Fluctus, fortius eſt Elementum quod reſiſtit, quam quod oppugnat. Exeſi Scopuli ac vaſta maris antra, ſatis ubique oſtendunt, quantum Oceani impetus lapſu ſeculorum poſſit efficere: verùm hæc ipſa quoque quid non poſſit efficere Oceanus, multo clarius oſtendunt.* Hæc *Iſaacus*.

Cum vero non de *Taprobanæ* ſolum Freto commentatur, ſed de Fretis in univerſum, & quidem Argumento *à conſtante & tenoris ſui obſervante rerum natura* accepto, videamus quam hæc cum Oceanis & Freto noſtris conveniant, & in iis quam conſtanter agat Natura.

Oceani *Britannici*, prout nunc dierum eſt, cum latitudo tum profunditas inveſtiganda, ut ex iis de priſco ſeu Freto, ſive Sinu, poſſimus ſententiam ferre. Ut autem eas comperiamus, adeunda eſt Tabula *Halleiana*, ſui generis omnium accuratiſſima. Ea docemur, in Oceano *Britannico*, ubi Terrarum hiatus hac illac ampliſſimus eſt, à veterum *Ocrino (Lizard-Point)* ad Inſulam ei oppoſitam *Uſhant*, unum eſſe gradum cum ſemiſſe, id eſt, Leucas quaſi triginta, ſive milliaria 90. Hinc Oceanus ſe in oriente parum adducit, at multo magis ubi Promontorium in eum procurrit *Normannicum*: ibi enim eſt dimidio adductior; cum inter *Peverel-Point*, & *Cape de Hague* è regione ſita, Leucarum *Anglicarum* quaſi 16 diſtantia ſit. Tunc ſe iterum effundit, ubi *Sequanam* recipit: at brevi in arctum agitur, inter *Beachy-Head* & *Cape St. Vallery*. Dein paulatim anguſtior, faſtigiat ſe molliter uſque dum in Fretum contrahitur, inter *Neſs Anglorum* & *Gallorum Blackneſs*, non amplius octo Leucis, id eſt 24 milliaribus patens. Terræ tunc aperiuntur longe lateque vaſtiſſimæ, & ſpatium Mari faciunt *Germanico*. Hæ ſunt Oceani Fretique *Britannici* diverſæ latitudines; quibus apparet, eas ſi non continuo, tamen adeo rara tamque exigua cum ampliatione minui, ut argumento noſtro nihil inde queat derogari. Ita enim Oceanus contrahitur, ut qui initio, ſeu Faucibus ejus *Britannicis*, Leucas triginta, ſive Milliaria præterpropter nonaginta latus ſit, poſt Leucas 153 circiter, ſive Milliaria 460, (quæ hujus Oceani longitudo eſt) ad 24 Milliaria contrahatur; id eſt ad primæ latitudinis partem quaſi quartam.

(a) In Notis ad Melam.

Profunda hujus Oceani altero jam loco ſunt expiſcanda, & quidem optime beneficio ejuſdem Tabulæ. In ea dividitur Oceanus *Britannicus* una cum Freto, in Columellas, numero decem, oblongas. Harum ſingulæ latera ſunt ex circulis Meridianis accepta; quæ cum in plano ducta ſint, videntur eſſe recta. Columellæ terminantur adverſis *Galliæ Britanniæque* litoribus: hoc eſt, Lineis huc illuc curvatis in litorum morem.

Incipiamus à prima in occidente, quæ & longiſſima Columella eſt: & (præmiſſo quod, *Hiberniam* & *Galliam* inter, Oceanus orgyias altus ſit in locis compluribus octoginta; uti paulo ulterius in aperto Mari, 100, 120, 140) notandæ ſunt in prima Columella *profunditates* omnium altiſſimæ; quæ decies exploratæ ſe habent, ut 58, 66, 63, 65, 58, 65, 68, 60, 60, 60. quæ *profunditatum* Summæ faciunt 623 orgyias. Eæ per decem, i. e. *profunditatum* numerum, diviſæ, mediam earum *profunditatem* oſtendunt eſſe 62. In Columella altera, decem altiſſimarum media *profunditas*, ſimili modo inveſtigata, eſt orgyiæ 51. In tertia 51. In quarta 40. In quinta 43. In ſexta 40. In ſeptima 36. In octava 37. In nona 33. Poſt nonam Columellam, cum Oceanus in lævam flectitur, & obliquus in Fretum deſinit, accipiam illud ut Terris interjacet, in *Britannia* locis appellatis *South Foreland* & *Haſtings*, in *Gallia St. Vallery* & *Eſtaples* incluſum. Hic *profunditatum* decem media eſt 30. In Freto anguſtiſſimo 16: quæ ad profunditatem mediam in prima Columella, eſt, ut 16 ad 62; id eſt, ut 1 ad 4 fere; & ad altiſſimam profunditatem *Galliam* inter *Hiberniamque*, ut 16 ad 80, i. e. ut 1 ad 5: ad altiſſimam in aperto Mari, ut 16 ad 140; i. e. ut 1 ad 9 fere.

Qua proportione minuitur altitudo Maris, ea creſcit Terræ Mari ſubjectæ acclivitas; & eſt illi in *ratione inverſa*: quæ utique propoſitio, ſi non ex omni parte vera, (propter orbis figuram minime rotundam) tamen adeo veræ proxima eſt, ut argumentationi noſtræ ſufficiat. Eſt ergo Terra, in Freto noſtro anguſtiſſimo undis ſubjecta, quam in Oceani *Britannici* faucibus, orgyias 46, id eſt pedes 276 altior; & quam Terra, *Galliam Hiberniamque* inter, Oceani ſubjecta, orgyias 64, ſive pedes 384 altior; & quam Terra, aperto Mari ſubjecta, 124 orgyias, ſive pedes 744 altior. Vide quanta ſit Terræ ab alto Mari ad Fretum acclivitas; eaque ut ex calculo prædicto patet, fere continua. Hæc eſt Oceani *Britannici*, tam in illius Latitudine, quàm Profunditate contractio.

Age, nunc tendamus ultra, velis expanſis, in Oceanum *Germanicum*: Hic Mare ſubito patentius, ſic, ut etiam profundius: quod inter Promontoria *North Foreland*, *Orfordneſs*, Oppida *Caletum* & *Oſtendam* interfluit, decem maximas habet menſuras, quarum media 24 Orgyias cum $\frac{4}{5}$ continet: quod inter *Orfordneſs*, & *Yarmouth*, *Texellam* & *Oſtendam* eſt, maximas decem menſuras habet, quarum media 25 Orgyias cum $\frac{1}{5}$. Quicquid ultra eſt, Terris hinc ad occidentem illinc ad orientem ſe retrahentibus, vaſtiſſimus eſt Oceanus, in quo menſuræ ſunt ab orgyiis 45 ad 50 numero quamplurimæ. Hæc a Freto *Britannico*, tam in oriente quam occidente, Terræ declivitas (quæ a Maris altitudine utrobique aucta patefit) omnino probat, *in ipſo Freto jugum eſſe Terræ excelſum, acutum*; quod cum hodie non multum infra Maris ſuperficiem eſſe reperiatur, olim ſe emergere, hoc eſt *Cherſoneſum olim hic fuiſſe*, *monſtrat*.

Alia ſunt duo, quæ cum in hac re momenti ſint immenſi, tenore tum minus certo, & natura minus ſunt conſtanti; quandoquidem a Maris motu & ventis accepta. In refluxu Maris Aquæ nunc quieſcentes incubant arenæ; nunc eam molliter præterlabuntur. In æſtu mitiori, Litus & ima Rupium blandiſſime lambunt, tenerrime oſculantur. Fervente vero æſtu, res omnino alia eſt: Aquarum Fremitus auditur, Fluctus cernuntur, & ſe non parum attollunt. Nihilominus ſine multa ſtrage, terriſve aliquot annorum millibus exeſis, hæc omnia poſſe fieri, cum *Voſſio*, cogitandum eſt.

Sin æſtuanti Mari, quod altero loco dicendum eſt, Ventus ſuperveniat: papæ! quoti, quantique Fluctus advolvuntur! *Alpes* exiſtimare licet Cryſtallinos, niſi quod cito diffluant. Tanta vis Aquarum ex Oceano occidentali in *Britannicum* immittetur, & tanto impetu, quantus in univerſo Terrarum orbe rarus inveniatur; imo quantus ab ipſo rerum initio rariſſime. Oceani *Britannici* tum brevia, tum anguſtiæ, continuo pæne (quod oſtenſum eſt) creſcentes, faciunt, ut Aquæ ſic impulſæ mirum in modum eleventur, & in Iſthmum (quem argumenti gratia fuiſſe damus) arietent, ita ut ab iis Iſthmum exundari, deteri, ablui; ſicque Inſulam fieri *Britanniam* non videatur ἀδυνάτων ἕν; verum e contrario factu probabile. Quantæ Ventorum, at præcipue Zephyri Caurique virtutes ſint, in cogendo impellendoque hoc Oceano *Britannico*, paucis expendam, a Doctiſſimo viro *Rad. Bohun*, *(Novi* olim *Collegii* Socio, qui *de Ventis* omnium eruditiſſime ſcripſit) hac in re adjutus.

Adeo ſævus, horribilis, iracundus ſæpe Zephyrus, Vires in Oceano, qui *Europam* & *Americam* vaſtus interjacet, acquirens, & in ampliſſimo hocce campo recenſens, vix concipi poteſt, quanto *Britanniæ Galliæque* oras impetu invadat. Exploratiſſimum enim eſt, in haſce oras eum communiter anni plus dimidio flare, (quod jam olim a *Julio Cæſare* notatum) & flatu eas ſæviſſime verberare: maxime autumno, a quo ſumunt originem Tempeſtates Idiomate noſtro dictæ [*Michaelmaſs-Storms*] eumque adeo interdum ſævire, ut ſi cum æſtu fervente jungi Ventus his acciderit, tam Oceanus *Britannicus*, quam Fretum *Sabrinianum* immane quantum augeantur. *Sabrina* vaſtiſſime turget. *Uzella* longe lateque *Somerſettenſem* Agrum exundat. Mirum ab hiſce Cataclyſmis quantum * mea patria perpeſſa eſt. Continuatur æſtus ad uſque *Tewkesbury*, id eſt milliaria magis ducenta. Apud *Chepſtow* Aqua pedes interdum octoginta aſſurgit. Idem fere dicendum de Oceano *Britannico*, Venti ejuſdem viribus elato: niſi quod hic, Cherſoneſo jam effracta, liberius Aquæ moveantur, non adeo ſiſtantur, non tantum eleventur; quæ utique Aquaram libertas ante Cherſoneſum abruptum, nequaquam adeo magna eſſe potuit. Hac igitur de cauſa [*Zephyro* nempe, *Cauro*, ſive alio Ventorum aliquo, Maris æſtui ſuperveniente] Oceani *Britannici* Undam in Iſthmum validiſſime impingi, & ab illis primùm ejus ſuperficiem, quæ ex Silice & Calce (prout hodie Terræ e regione oppoſitæ) conſtabant, ablui; deinde Iſthmi quod reliquum erat, ſpatio bis mille annorum & eo amplius, Aquæ fluxu refluxuque ad 16 orgyias, quæ hodierna Freti hujus (quod diximus) altitudo eſt, atteri; credibile veriſimile eſt.

* Devonia.

Tantum abeſt, ut *Voſſio*, Fretorum perpetuitatem a naturæ in operibus ſuis *conſtantia* tenoreque eodem arguenti, fidem habeamus; ut e contrario Fretum hocce noſtrum illius *inconſtantiæ* deberi, lubens agnoſcerem. Vir ille clariſſimus, naturæ uſitatum agendi modum unice reſpiciens, *extraordinarium prætermiſit*; qui tamen, in raris hujuſmodi effectis, potiſſime videtur reſpiciendus. In Freto *Siculo* conſiderando, ejuſque diducendi modo inveſtigando, quis Ignis ſubterranei ſupra modum erumpentis, tamquam Cauſæ hac in re probabilis, non meminerit? niſi iſtam *Catanenſium* ἀτοπίαν conſecutus, qui (tradente *Alphonſo* (1) *Borello)* poſt Eruptionem *Ætnæ* diu intermiſſam, Ignem ejus immodicum ne ſemel quidem unquam fuiſſe, ſatis inſulſe putavere. Ut Vento nihil inconſtantius, ſic ad Fretum hoc aperiendum (poſito cauſarum apparatu cætero) nihil conducibilius: & cum eo res deducta eſt, *fortius elementum eſſe quod oppugnat, quam quod reſiſtit*, (aliter quam *Voſſius* ſtatuit) omnino probabile mihi videtur.

Non alienum erit hic Inundationum aliquot exempla, uti revera fuere, in medium proferre; quibus abunde patet, Terræ faciem frequenter obrui, & ab iis non parum mutari. Hic autem nihil neceſſe eſt, ut *Helicen* & *Burin*, *Achaiæ* Urbes adeamus: de quibus tanquam magnarum Inundationum argumentis, (2) *Ovidius*, & diu ante illum (3) *Ariſtoteles*. Graviſſimas fuiſſe Oceani noſtri, tam *Germanici* quam *Britannici*, ſatis oſtendunt Hiſtorici Geographique.

In *Zeelandia* (4) Inſulæ undecim, & in iis Oppida & Pagi (quorum hodie ſummitates aliquæ refluxu Maris in conſpectum veniunt) numero ter centum (5) obruebantur.

Anno 1014. [*Mare Litus egreditur III. Cal. Octob. & in* Anglia *Villas quamplurimas innumerabilemque populi multitudinem ſummerſit.*] (6) *Simeonis Dunelmenſis* Hiſtoria de Geſtis Regum *Anglorum*. De hac, ut opinor, Inundatione videatur etiam Chronicon *Joh. Brompton* (7).

Anno 1099. [*Tertio Non. Novemb. mare Litus egreditur, & villas & homines quamplures, Boves & Oves innumeras demerſit*] *Sim. Dunelmenſis* (8) Hiſtoria.

A. D. 1176. [*Mare extra fines in* Anglia *erumpens multos in* Hollandia *homines & pecora abſorbuit, & quaſi poſt biduum furore ſedato in ſemet ipſum rediit.*] Chronicon *Johannis Brompton* (9).

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(1) In Libro de *Incendiis Ætnæ*. p. 117.

(2) Invenies ſub Aquis, & adhuc oſtendere nautæ
Inclinata ſolent cum mœnibus oppida verſis.

1 Metam. Lib. 15.

(3) Τὸ δὲ ἀνάλογον συμπίπτει τούτοις καὶ ἐν θαλάσσῃ. Χάσματα γὰρ γίνεται θαλάσσης, καὶ ἀναχωρήματα πολλάκις, καὶ κυμάτων ἐπιδρομαί, ποτὲ μὲν ἀντανακοπὴν ἔχουσαι· ποτὲ δὲ πρόωσιν μόνην, ὥσπερ ἱστορεῖται περὶ Ἑλίκην τε καὶ Βοῦραν. *Ariſt.* de Mundo. (4) *Heylin*'s Geogr L. 2. In Belgio. (5) *Laet* Deſcriptione Belgii, p. 124. (6) Apud Hiſtoriæ *Anglicana* Scriptores X. p. 171. (7) Apud eoſdem, p. 892. (8) Pag. 224. (9) Pag. 1117.

Inſolitam maris inflationem & commotionem Anno D. 1250. factam, tradit *Matthæus* (10) *Pariſienſis.* [*Unde Mare perturbatum fines ſolitos pertranſiens, tam horribilem mugitum cum fremitu edidit, ut per remota Terræ ſpatia, non ſine ſtupore audientium, reboaret. Viſum eſt etiam ſub opaca nocte ipſum Fretum quaſi accenſum ardore, & Fluctus Fluctibus conglomeratos dimicare. Apud* Wincheleſe *pluſquam 300 domus cum quibuſdam Eccleſiis per Maris violentum aſcenſum ſunt ſubmerſæ.*]

Anno 1251. inquit idem (11) *Matthæus* [*In* Frigia (*quæ* Friſelandia *appellatur) Aqua Diluvium fecit particulare, occupans Terræ illius ſpatium itineris circiter ſeptem dierum. Poſt* 40 *dies ille damnoſus Fluctus in locum ſuum remeavit.*]

Anno 1286. [*Ingruente fortiſſimo Vento, flante de partibus Orientis, qui & Eurus dicitur, & fluxu Maris ſuper provinciam* Hollandiæ *terribiliter invaleſcente; prævaluerunt Aquæ Maris, adeo ut Foſſata, quæ Terram ipſam & Mare diſterminant, inopinatius quam credi poterat, tranſgrederentur; poſuitque Terram fructiferam in ſalſuginem tam repentinus Maris impetus; qui per indigenas nullatenus poterat obviari: & maxima pars S.* Botolfi *ſubmerſa, hominumque & pecudum inæſtimabilis periit multitudo.*] Ita Chronicon *Tho.* (12) *Wikes.*

DE *Hollandiæ* Inundatione ſic *Hadrianus Junius* (13) in *Bataviæ* Hiſtoria [*Quadringentis abhinc annis inaudita* illa *Inundatione quæ univerſam* Hollandiæ *faciem longe lateque operuit, obſtructo fluminis* (Rheni) *curſu, ſteriles arenarum colles Litus occuparunt. Mare, Terras, ipſamque Litoris oram attrivit.*]

Anno 1404. quo beatiſſimus noſter *Wiccamus* obiit, [*Tanta repente ruptis limitibus irrupit Aquarum influentia in Cantio, quanta nunquam fuerat illic ante viſa, qua ſubmerſa ſunt animalia numero & pretio exceſſivo: nec ſolummodo deflevit* Anglia *damna talia, ſed ut fertur,* Zelandia Flandria *&* Hollandia, *per Undarum excrementa, innumerabilia ſenſit diſpendia eo anno.*] Hypodigmate *Neuſtriæ* per *Tho.* (14) *Walſingham.*

[Regnante Edwardo I. *cum Oceanus ventorum violentia exaſperatus, hunc* (Cantii) *tractum operuiſſet, lateq; hominum, pecorum ædificiorumque ſtragem dediſſet, &* Bromhill *viculo frequente peſſundato, etiam* Rother, *qui hic prius ſe in Oceanum exoneravit, alveo emovit, oſtiumque obſtruxit, novo in Mare aditu compendio per* Rhiam *aperto*] *Camdenus* in *Britanniæ Cantio.*

Quid quod *Tungros*, oppidulum *Leodienſe*, a Mari pene centum milliaria jam remotum, Mare quondam adluere opinati ſunt Viri doctiſſimi, argumento non uno perſuaſi (15).

Neque noſtra ætas caruit hujuſmodi Exundationibus: Narrant Novellæ *Feb.* 27. 1713. in *Eſſexia*, plura Terræ jugerum millia, per milliaria aliquot, inter *Barking* & *Purfleet*, everſis obſtaculis, Maris influxu obrui.

Hæc de Oceani *Germanici* exundationibus: *Britannici* noſtri, & *Sabrinæ*, neque pauciores, neque minores ſunt. Enimvero vidimus ætate noſtra Iſthmum, uno eodemque *Pededri* fluxu & refluxu (Terræ ſuperficie prius ab

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(10) Pag. 535. Ed. *Watſiana.* (11) Pag. 549. (12) Pag. 114. (13) Pag. 196. (14) Pag. 564. Ed *Francofurt.* MDCIII. (15) *Verſtegan*'s Antiquities, pag. 102. *Ray*'s Phyſico-Theological Diſcourſes, 1693. pag. 169.

Agricolis ſemota) dilui, fluviumque veteri curſu relicto novum acquirere: hoc, inquam, unico fluvii iſtius æſtu factum vidimus, nullo auxilium præbente vel Undas adigente Vento.

Sabrinæ fluminis impulſu fieri probabile eſt Exundationem illam, qua in Agro *Monumetenſi*, Parœciæ N°. 26. A. D. 1607. menſe *Januario* Aquâ obruerentur: Cujus eodem Anno publicata fuit (16) Hiſtoriola.

Johanne rerum *Anglicarum* potito [*Subita & improviſa Aquarum Inundatio pluribus in locis per* Angliam *facta eſt, unde plures homines ſubmerſi ſunt, & domus everſæ, maxime apud* Exceſtre & *Sanctum* Ivonem] Imagines Hiſtoriarum Autore (17) *Radulfo* de *Diceto*. [Poſt diutinam malaciam, mare *Vergivium*, adeo per totam hyemem, regnante tunc *Henrico* ſecundo, tempeſtatibus agitabatur, ut toto illo temporis ſpatio, Navicula nulla ad *Hiberniam* adpulſa, de reliquo terrarum orbe nihil apud eam inauditum. Terror hinc univerſus, tamquam malo impendente quodam gravi, de cœlis miſſo. Arenarum aggeres, in Auſtrali *Cambria*, quaſi Cataclyſmo abluebantur, Litora ſubvertebantur] *Giraldi Cambrenſis* (18) *Hibernia* expugnata.

At ô quam terribilis illa tempeſtas, qua, Maris Undam in Oceanum *Britannicum* impellente *Africo*, ita ille turgebat, ut Pharos illa celeberrima, *Eddiſtone* appellata, quæ fuit e regione *Plimuthæ*, tamquam in contemptum *Æoli Neptunique* fabricata, quaſi ludibrio habita ſimul cum ædificatore dirueretur. Cujus utique tempeſtatis in hoc noſtro Oceano ſi non eadem vis & poteſtas eſſe videatur, atque illarum in prædictis Oceani *Germanici* Exundationibus, propter majorem ab hiſce ſtragem & damnum in *Hollandia Zeelandiaq;* factam; Litoribus hoc noſtris rupibus munitis, quæ & duriores & altiores quam apud *Batavos* ſunt, deberi judico.

Tempeſtates (ut argumentum hoc conficiam) quæ in Oceanis *Germanico* & *Britannico*, noſtra & patrum memoria ſæviere, & de quibus omnino conſtat, adeo fuere turbulentæ, ut ſi earum aliquæ in Cherſoneſum, ad hoſce dies uſque manentem, recta fuiſſent collineatæ, nullus (ut opinor) eſſet dubitandi locus, quin a tanta vi auferretur Iſthmus: & tot annorum ſæculis, quot illico dicentur, revera hoc accidiſſe nequaquam improbabile videtur. Sin ex *Americâ* turbo maris æſtui ſuperveniat, mare, cœlum, omnia miſcens, omnia confundens, ac ſi naturæ inſtaret diſſolutio, (poſſe vero hæc concurrere nemo ſanæ mentis ibit inficias) En cauſam huic negotio parem!

Alterum hujus Diſſertationis membrum jam aggrediamur, & ſpeciatim inquiramus, utrum exeſa fuerit revera hæc Cherſoneſus; annon. Si de ejus dividendæ modo, quî fieri poſſet, conveniat, magna inde lux emanabit, unde argumenta, quæ a Viris doctis paſſim afferuntur, ad diviſionis hujus probabilitatem arguendam, egregie confirmabuntur: præmiſſo nempe (quod hactenus fuit deſideratum) Vento, ejuſque in elidendo hoc Iſthmo virtute omnium cauſarum maxima, tantoque negotio (cùm cæteris) pari. Horum ego argumentorum nonnulla perſequar; ſed leviter tangam, utpote ab aliis fuſius antehac tractata.

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(16) *Lamentable News from* Monmouthſhire. (17) Pag. 710. (18) Cap. XXXV.

Primo, Terræ jugum illud notabile, quod Freto ſubjicitur, & de quo ſupra; quid aliud ſibi vult, quam quod eo loci Terra olim multo altior eſſet; at, Maris per aliquot annorum millia reciprocationibus, ad eum in quo nunc eſt ſtatum abluta & detrita? Præcipue, ſi advertamus Regulam hanc conſtantem & perpetuæ veritatis eſſe, *Maris* ſcil. *imum, quo magis Oceano præterlabente tritum, (quantum patitur ejus durities) eo magis planum & æquale reddi.*

Quid deinde Rupes in Freti Litoribus oppoſitis, ſive Montes prærupti, albi, ex eadem materia, Calce nimirum & ſilice compoſiti, ad ſex utrobique milliaria, ſibi invicem, tanquam Teſſeræ reſpondentes; quid, inquam, volunt, niſi olim interfringi ſe, & ablutione Terræ interpoſitæ diſrumpi?

Tertium, apprime convenit cum iſthac Cherſoneſi *Britannicæ* opinione, tractus illius, qui hodie *Rumney-Marſh* appellatur, ratio & ingenium. Durante enim Iſthmo, cum Oceani fluxus eo tanquam obice ſiſteretur, æſtuare eum neceſſe erat, atque adeo Terram illam *Rumneienſem*, utpote planam & humilem, in propinquo exundare. Hoc oſtendunt Oceani *Britannici* Fluxus hodieque hac planitie altiores, aggere fortiſſimo & magnis ſumtibus aſpulſi: Dentes item oſtendunt, atque Oſſa, ſive Hippopotami ſive alius cujuſdam marini animalis (19), anno 1668, *Charthami*, altitudine pedum 17, dum puteus aperiretur, eruta: at luce clarius oſtendit Anchora, non ita pridem ex alto loca hæc circiter effoſſa. Perrupto autem Iſthmo obiceque jam remoto, Oceani unda ſubſidit, a Terra illa receſſit, in alveum ſe contraxit; unde quæ olim Æſtuarium, hodie Planities, longa viginti milliaria, lata octo, eaque fertiliſſima bobus ſaginandis aptiſſima reperitur.

Noviſſime, fac Cherſoneſum olim fuiſſe, Lupos, aliaque animalia, generi humano inimica, poſſe huc migrare, conceptu facillimum eſt: at ſi illa non fuit, navigiis ea, tamquam ad tuendas & conſervandas eorum Species, advehi, ſtulte cogitabimus?

Neque me moratur, quod nulla ſive *Latinorum*, ſive *Græcorum*, ſive alius cujuſvis populi Hiſtoria Cherſoneſi hujus abruptæ mentionem feciſſe perhibeatur, (quamvis hoc nequaquam ex omni parte verum:) Dic ſodes, Hiſtoriæ quam brevis ſit ætas, ſi ad ætatem mundi comparetur. A rerum initio ad primam, quæ nunc exſtat (i. e. *Herodoti)* Hiſtoriam, 3500 circiter anni ſunt; & a *Noæ* Diluvio, 1800. At tam immenſo temporis ſpatio (quod ſupra innuimus) quæ Cauſarum accidere poſſint συζυγίαι; quæque ex iis in orbe noſtro fieri mutationes, nemo tam cito ſtatuere debebit. Dixi *hoc nequaquam ex omni parte verum:* quid enim planius illo *Virgilii*, —— *Penitus toto diviſos orbe* Britannos. [*Nonne putatis*, (inquit eruditiſſimus & Antiquitatem *Britannicarum* ſcientiſſimus (20) *Joh. Twinus*) *vocabulum* [diviſos] *habere eam vim ut ſignificat abſciſſionem alicujus ab aliquo? Et Auctorem mire gnarum ſignificationis fuiſſe, & rerum antiquarum maxime peritum, & bene memorem ſui? Ad hæc verba* Servius [*Quia olim juncta fuit Orbi* Britannia.] Nihil clarius eſſe poteſt ad demonſtrandum Iſthmi hujus diviſionem veteribus

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(19) Vide Clariſſ. *Somneri* Diatribam *Chartham-News* appellatam: Et Clariſſ. *Walliſii* de hac Cherſoneſo Diſſertationem, ſupra traditas. (20) Derebus *Albionicis*, pag. 22.

fuiſſe

ſuiſſe notam. Ut omnino fruſtra eſſe *Voſſius*, & nimio plus ὑποθέσει δουλεύειν exiſtimetur, cum in Fabellis *Ægyptiacis* (quo nempe ſuæ opinioni habeatur honos) eam poni voluerit.

Concludimus ergo e prædictis ſimul acceptis. ***Britanniam non jam inde ab initio fuiſſe Inſulam, ſed ex Pene-Inſula factam: idque ut videtur, a Vento e ſævioribus aliquo, cum Maris æſtu concurrente & Iſthmum perrumpente.***

The Veſtigia of a Roman Town near Leeds, *by Mr* Thoresby. *n.* 282. *p.* 1285.

VIII. The *Veſtigia* of a *Roman* Town, upon the *Moor* near *Adel* Mill, four Miles from *Leedes*, were found out accidentally by a Tenant of Mr. *Arthington*, who endeavouring to plow part of his Farm, was retarded by a great quantity of Stone, immediately below the ſurface of the Earth, which he was forced to dig up before he could proceed, and has already out of the Foundations of Houſes, which they traced on both ſides the Street, got ſo many Stones as has built above 100 rods of Walling. At a very little diſtance is a *Roman Camp* pretty entire, 'tis above four Chains broad and five long, ſurrounded with a ſingle Vallum, which from the top of the Agger to the bottom of the Trench is yet 22 foot deep in the place I meaſured. The Town ſeems to have been of conſiderable note by the *Inſcriptions*, and fragments of *Statues*, *Pillars*, *&c.* there dug up, all which are (as Dr. * *Liſter* has truly obſerved, of moſt of the *Roman Monuments* in theſe parts) made of the common ſort of courſe Rag or Millſtone grit, of which are alſo the remains of a large *Aquæduct*, in Stones of great length and about ¾ of a yard thick, wherein the paſſage for the Water is about 6 inches broad and as many deep, almoſt double to thoſe of Clay found in the *Roman* Burying-place at *York*, formerly † accounted for. Some time ago here was dug up a *Statue* to the full proportion of a *Roman* Officer, with an Inſcription, both which periſhed through the brutiſh ignorance and covetouſneſs of the Labourers. *Cyril Arthington*, Eſq; who is Lord of the Mannor, made me a preſent of two Inſcriptions, the one is but a fragment, yet has enough to diſcover it to have been ſepulchral, by H S E for *Hic ſitus eſt*, below *PIENTISS*, the other is almoſt entire, and is evidently a *Funeral Monument*, it begins as uſually with *Diis Manibus Sacrum*, and ends *Vixit Annos X.* as it ſeems to have been by the vacancy; 'tis one foot thick, two broad and three high, the Letters are very large, full three inches long, ſome of them interwoven, as AND (AD) and ED (as I apprehend the EC to be) in *Candiedianæ*. The form of the Letters, and particularly the A may perhaps diſcover the Age that this *Roman* Station flouriſhed in, *viz.* in *Severus*'s Reign (*An. Dom.* 194) or before, if Mr. *Cambden*'s ** obſervation hold good, and I know none of the modern Criticks that diſſent from it. " This " obſervation (ſays he) I have made, that from the Age of *Severus* to that " of *Gordian* and after, the Letter A in the Inſcriptions found in this Iſland, " wants the croſs ſtroke, and is engraved thus Λ. It ſeems to have periſhed, and perhaps was burnt down (as by the ſlag and aduſt colour in ſome places may be conjectured) in ſome of the Inſurrections of the Native *Brigantes*, who were impatient of Reſtraint.

* *Phil. Collections No.* 4. *p.* 90. 91. *Abr. Vol.* iii. *p.* 416.

† *Phil. Tranſ. n.* 234. *Abr. Vol.* iii. *p.* 421.

** *Britannia. N. E. p.* 808.

Among the ruins were found two or three *Millſtones* for the grinding of Corn, which by the ſmallneſs of the ſize (20 inches broad) ſhew that the *Romans* of thoſe, as well as the *Ægyptians* and *Jews* of former Ages, made uſe of their Slaves or Captives for that employ, who were placed *poſt molas*, * *non præcedunt ſed ſequuntur, brachiis & toto corpore trudentes*; what the old MSS Bibles have in reſpect of *Sampſon* † *clauſum in carcere molere fecerunt*, our *Saxon* Predeceſſors render expreſly †† hanꝺcƿyꞃne. Beſides this, which is entire, I have a fragment of another Millſtone, whereon the Rows are yet remaining, but this being heavier, almoſt as thick at the Circumference as the other is at the Center (for they are convex on one ſide) I ſuppoſe might be the *Runner*. The Learned * *Gataker* obſerves, the Original word is of the *Dual form*, and that the Law prohibiting the taking the Millſtone to pledge, does particularly mention *Receb* or the *Rider*, becauſe that lying looſe might the more readily be taken off, and carried away upon that occaſion, and † ſays, the *Talmudiſts* have a Story, that the *Chaldeans* made the young Men carry Millſtones with them to *Babylon*, where there was a great ſcarcity of them, whence probably their Paraphraſe renders that Text, *have born the Mills* or *Millſtones*, which might be true in a literal acceptation, they have alſo a Proverbial Speech of a Man with a Millſtone about his Neck (alluded to St. *Matth.* xix. 6.) uſed of one that lyes under an exceeding heavy and almoſt inſupportable burthen.

* Exod. xi. 5.
†Judg. xvi. 21.
†† *Mr.* Thwaits's Hept. Anglo-Sax.
* *Notes on* Iſaiah 47. 2.
† *Note on* Lam. v. 13.

As we were traverſing the Ground, I found the fragments of *Urns* and other *Roman* Veſſels, one of which has been 23 inches, or two foot in Circumference, the generality of them are of the common red Clay, but I have alſo one of the beſt Coral coloured varniſh, and others of a bluiſh grey; as alſo a braſs Ring found in the ſame place. The *Roman* rig that this Town ſtood upon, comes from the great Military Road upon *Bramhammoor*, of which *Leland* in his MS Itinerary, which by the favour of my Lord Archbiſhop of *York* I have a tranſcript of as far as it relates to *Yorkſhire* or *Lancaſhire*, affirms, " I never ſaw in any part of *England* ſo manifeſt a token as " here, of the large Creſt of the way of *Watling ſtreet* made by hands. From thence this *via vicinalis* paſſeth by *Thorner* and *Shadwel*, *Streetlane* and *Hawcaſter ridge* upon *Blackmoor* (near which is a *Roman Pottery*) to *Adel*, thence thro *Cookridge* over the Moors towards *Ilkley* a known *Roman* Station. This ſame ridge is very evident in ſome part of the Grounds †† of *Tho. Kirk* of *Cookridge*, Eſq; who ſhewed me the place where a *Roman* Monument in his poſſeſſion was dug up, it ſeems to have had a large Inſcription, but ſo eraſed that nothing diſtinct can be made of it; perhaps the ſaid *Cukeryg*, as it is called in the Original Letters Patents of K. *Edw.* 6th to Archbiſhop *Cranmer* was ſo denominated from this *Roman* ridge which paſſeth directly thro' it.

†† *See* Phil. *Tranſ. n.* 316. *p.* 134. *and* Roman Coins *infrà*.

But what the name of this Station was I cannot divine, the learned Dr. *Gale* ſome years ago gave me notice from an Anonymous Geographer, of a Station in *theſe parts* called *Pampocatia*, which he thought ſhould be read *Campocatia*, and had ſent into *France* for various Lections, concluding, " Where to place this I know not, but my hopes are, that you will be ſo

" happy

Plate V. Part V. P. 49.

Fig. 3.

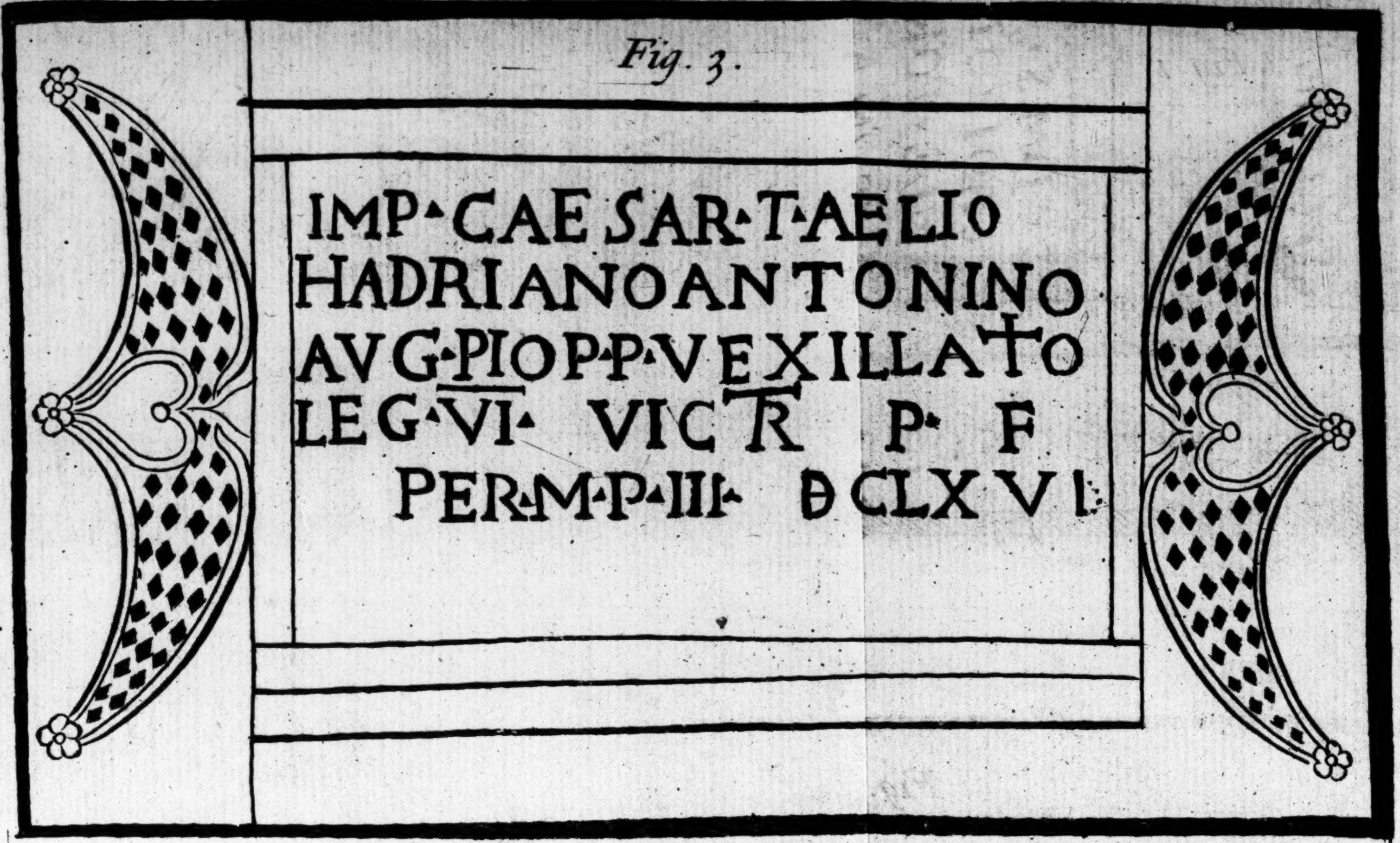

IMP·CAESAR·T·AELIO
HADRIANO ANTONINO
AVG·PIO P·P·VEXILLATO
LEG·VI· VICTR P· F
PER·M·P·III· DCLXVI

Fig. 8.

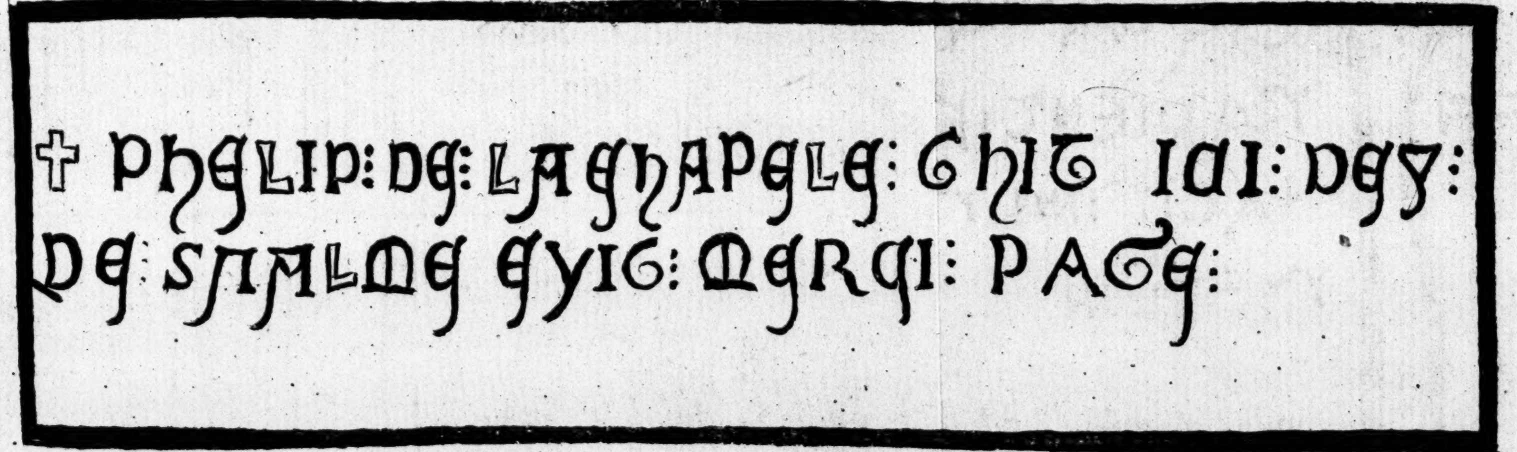
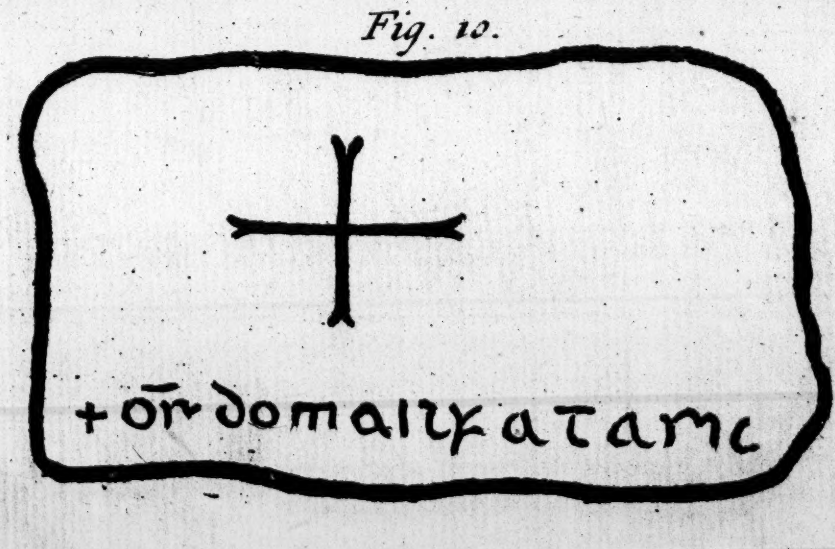

✝ PHELIP: DE: LA CHAPELE: GIT ICI: DEV: DE: SA ALME EYT: MERCI: PACE:

Fig. 10.


+ OR DO MAILFATAMC

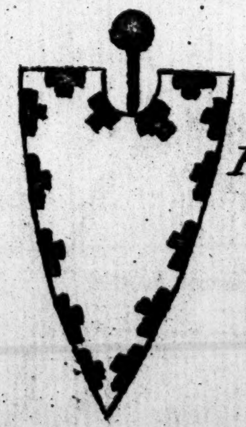


Fig. 11.

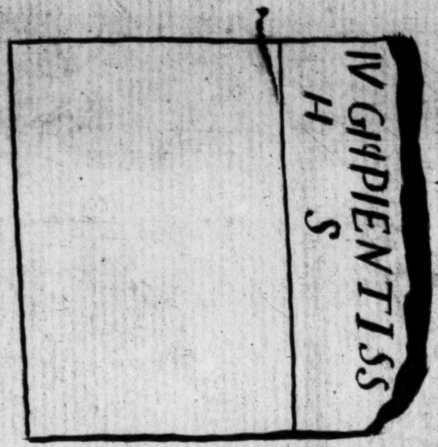

IV SAPIENTISS
H S

Fig. 1.

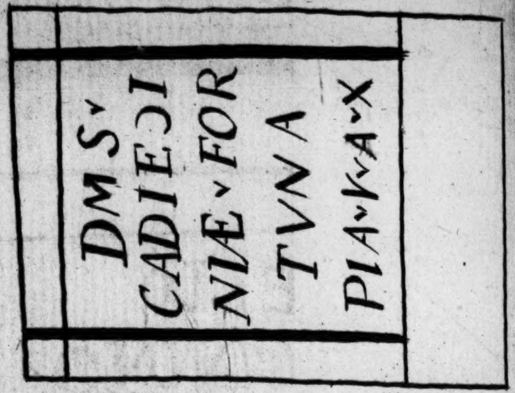

DMS
CADIEDI
NIÆ FOR
TVNA
PIA·V·A·X

Fig. 9.

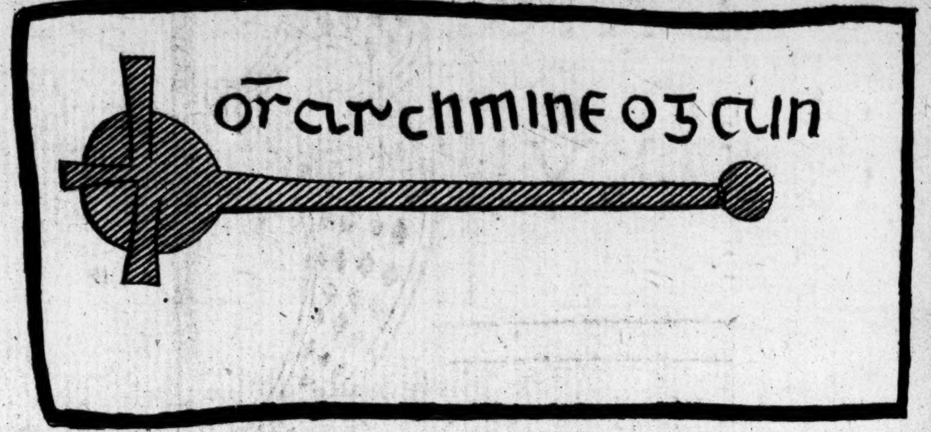

OR AR CHMINE O3CUN

Fig. 7.

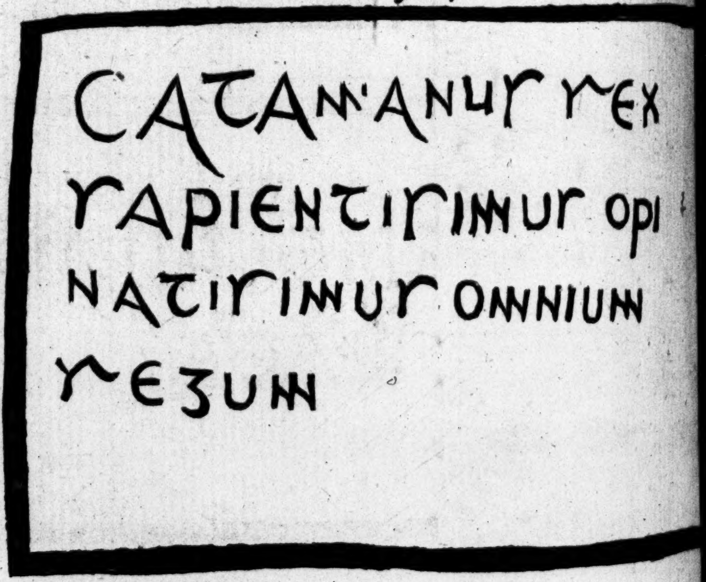

CATAMANUS REX
SAPIENTISIMUS OPI
NATISIMUS OMNIUM
REGUM

Fig. 6.

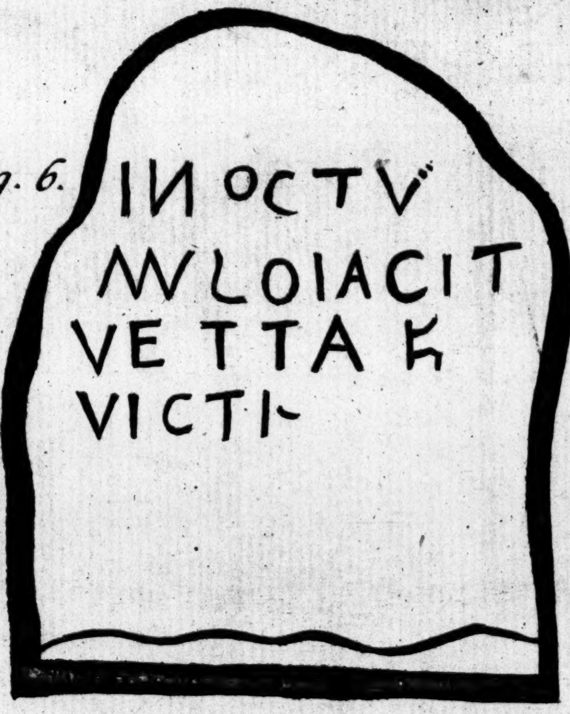
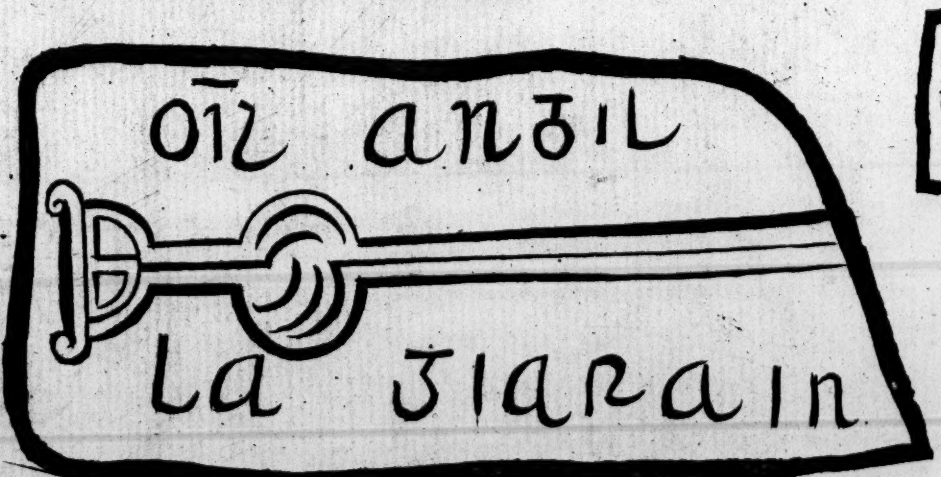

IN OCTU
MULOIACIT
VETTA F
VICTI

Fig. 5.


OR ANGIL
LA GIARAIN

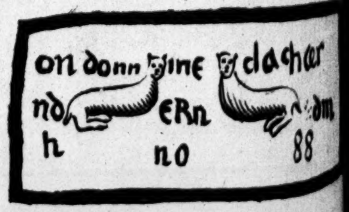

on donn tine da char
nd ERn dm
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Fig. 4.

"happy as to find it, and ſo kind as to communicate the diſcovery, *&c.* Now conſidering, that in the ſaid Author (Printed at *Ravenna*, *An. Dom.* 1688.) this *Pampo* or *Campocatia* is the very next Station to *Lagentium* or *Legeolium*, it ſeems not improbable that this Camp, *&c.* was the very place; but becauſe things ſo many Ages paſt admit of various conjectures, I will offer another, which I am induced to from the ſimilitude of the Names, the *Agel* or *Adelocum* of the Ancients, and the preſent *Adle* or *Adel* as it is in the *Monaſticon Anglic.* 'Tis true, 'tis ſometimes writ *Segelocim*, but as Mr. *Burton* * well obſerves, it is to be reckoned among thoſe Words to which the Ancients ſometimes put an S or *Sibilus*, and ſometimes omitted; if this be thought too much Northward for that Station, which is placed South of *Danum*, it may be reply'd, that, not to inſiſt upon the tranſpoſition of ſome places, of which there are inſtances in the Itinerary, I ſee no inconvenience in admitting that the *Romans* might then, as we at this day, have ſeveral Towns of the ſame denomination; thus from an Altar in my poſſeſſion, inſcribed *CONDATE* (the whole Inſcription may be ſeen in the new Edit. of the *Brit.* p. 782.) the ſaid Learned Dean of *York* concludes that *Conſley* near *Piersbridge*, where this Altar was found, was as well called *Condate*, as *Congleton* in *Cheſhire*. And to me it ſeems highly probable, that the Legions being detached againſt the Enemy to diſtant places, might endeavour to leave ſuch Memorials of their removes: Thus the *Legio viceſima valens victrix* uſually quartered at *Deva* or *Weſt Cheſter*, was detached into *Weſtmorland*, as appears by an Inſcription; and the *Lingones* who were ſeated at *Ilkley*, I queſtion not but were alſo at *Lingivel* near *Thorp on the Hill*, where the *Roman* Coyning molds † were found, and that the intrenchments there were ſo denominated from them, the *Roman Vallum* being pronounced *Wallum*, of which ſee *Caſaubon*, *Somner*, *&c.* At this *Agelocum* or *Adelocum*, as *Cambden* himſelf once read it, in a Church of the moſt Antique form that ever I beheld, and being built of ſmall ſquared Stones like the *Roman* Wall and Multangular Tower in *York*, I verily thought it the remains of ſome *Roman* Temple, till I found in it ſome Chriſtian Hiſtories, particularly the deſcent of the Holy Ghoſt in the form of a Dove, done in *Baſſo Relievo*, but after ſo intolerably rude a manner, as ſufficiently evidences their great Antiquity. The Inhabitants have an old Tradition, that *Adel* Church once ſtood upon *Blackhill*, the place where theſe *Roman* Monuments were lately diſcovered, occaſioned perhaps by the removal of the Stones from ſome publick Edifice, at the deſtruction of the old *Roman* Town.

When the *Veſtigia* of this *Roman* Station were firſt diſcovered, I was ready to fanſy it to have been the *Adellocum* of the Ancients, from ſome remains of the Name in the preſent *Adle* or *Adel*, as it is writ both in the *Monaſtic. Anglic.* and ſome ancient Charts in my poſſeſſion; but when I was laſt at *London*, having by the favour of *Peter Le Neve*, Eſq; *Norroy* King at Arms, an opportunity of peruſing *Domeſday-Book* in the Exchequer, I found beſides *Adele* and *Echope* beforementioned, another Place in the Neighbourhood, call'd *Burghedurum* or *Burgdunum*, which I am now ready to conclude, was the Ancient *Roman* Name of this Station: That the Itinerary

See Plate 4. *Fig.* 1.

* Com. on *Antonin.* Itin.

† Phil. *Tr. No.* 234. *Abr. Vol.* iii. *p.* 426.

n. 320. p. 314.

rary is ſilent herein, is no Argument againſt it, ſince only ſuch as lie upon thoſe Roads are particularly mention'd; but that it has, at leaſt, the Appearance of a *Roman* Name may be argued, becauſe *Burgi* was the common Name whereby they called ſuch Caſtles or Forts as were convenient for War, and well ſtored with Proviſions of Corn, as appears by the Authorities quoted by *Camden* and *Burton* in their Notes upon the *Roman Verteræ*, or *Burgh* under *Stanemoor*; and the *Burgundians* receiv'd their Name from their inhabiting ſuch Caſtles: and to me it ſeems probable, that the ſmall ſquared Stones, wherewith the very Antique Church at *Adel* is built, were brought from the Ruins of ſuch a Caſtle, and gave riſe thereby to an old Tradition, which continues to this day, that *Adel-Church* once ſtood upon *Black-hill*, the place where theſe *Roman* Monuments were found; the elevated ſituation of which place ſufficiently accounts for the termination of the Name, the *Gauliſh* or *Britiſh Dunum*, which ſignifies a Hilly or Mountainous Place, being naturalized in the *Roman* Provincial Language. I ſhall only add, that within a Mile of it, there are two ſcattering Houſes, that do to this Day retain the Name of *Burden-* (for *Burgdun-*) *Head*.

Of the ancient Carteia, *by* John Conduitt, *Eſq*; n. 359. p. 903.

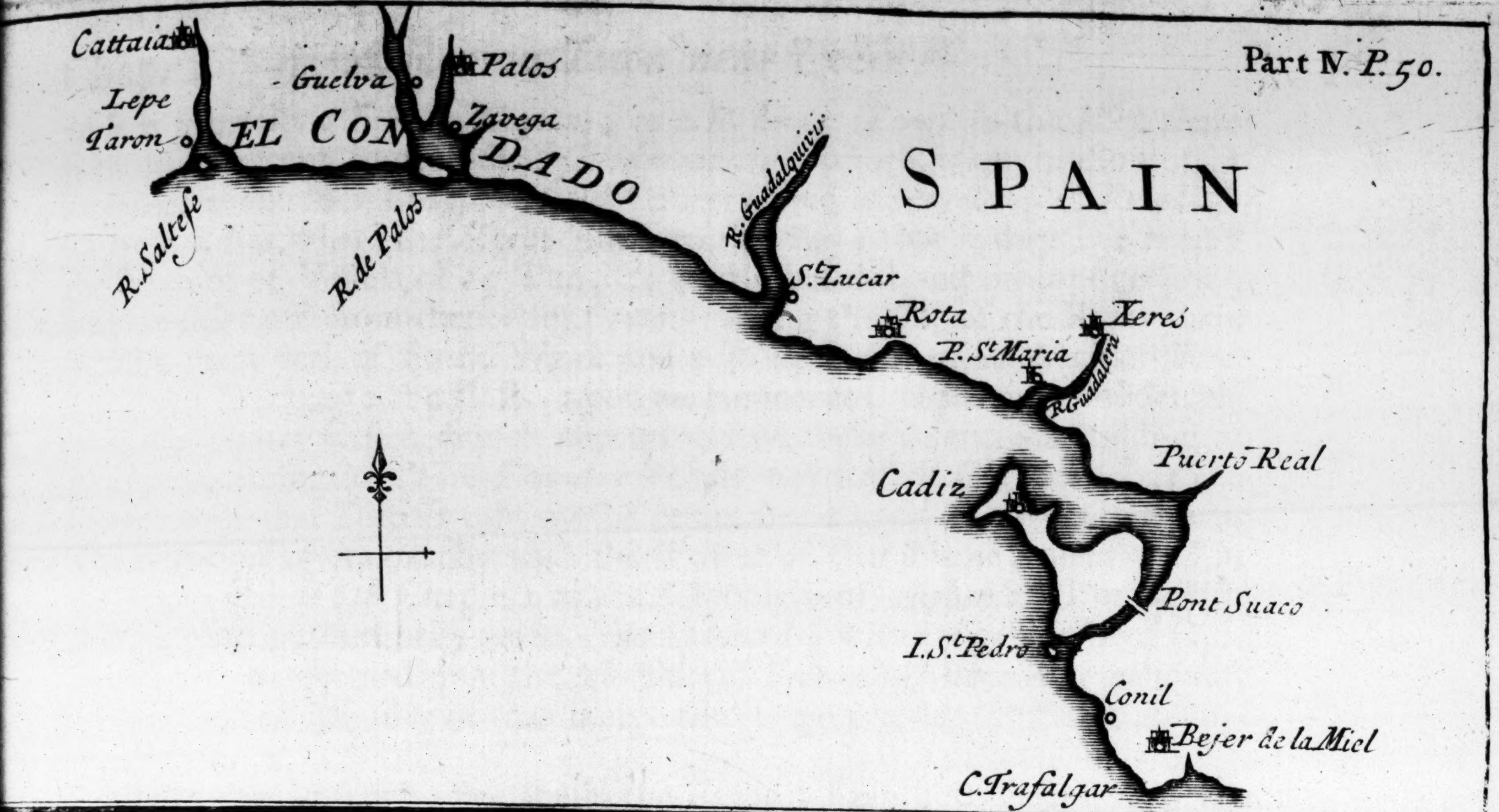
IX. About four *Engliſh* Miles *N. W.* from *Gibraltar*, at the end of the Bay, there are conſiderable Ruins. The place is called at preſent *Rocadillo*, and conſiſts of a few Huts, and a Modern Square Tower, which appears to have been raiſed on the Foundation of a much greater Pile. The Walls of the old City are very eaſy to be traced. They ſeem to have been about two *Engliſh* Miles in Circumference, and were built upon the Brow of a riſing Ground. The ſpace within is covered with Ruins, among which are a great many pieces of very fine Marble well wrought; and innumerable fragments of Veſſels of that kind of red Earthen Ware, which * *Ambroſio Morales* lays down for a certain mark of a *Roman* City, and takes to have been a Compoſition of the Clay of *Saguntum*, often mentioned among the *Romans*.

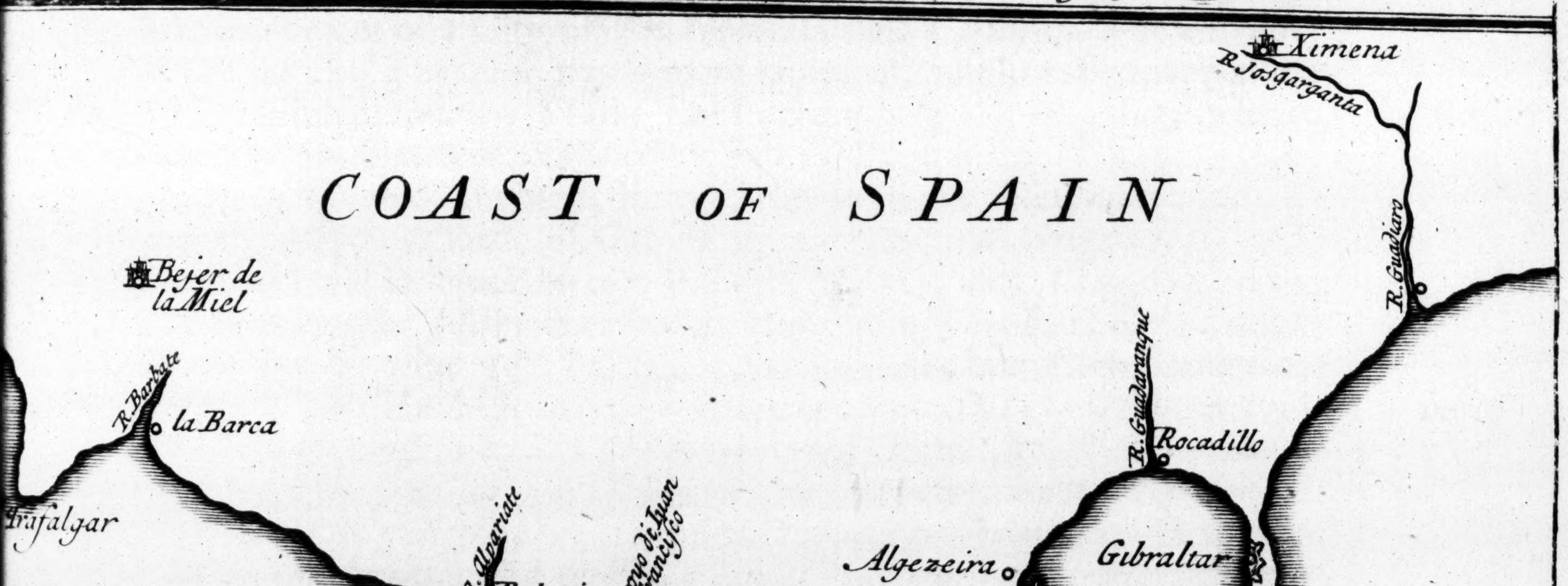
* Antiguedade las Ciudades de Eſpanaa. c. 1.

Ficta Saguntino pocula malo luto. Mar. Lib. VIII. Ep. 6.

Sume Saguntino pocula ficta luto. Lib. XIV. Ep. 108.

There are remains of a rude Semicircular Building, raiſed on Arches, which deſcends gradually into an Area, and ſeems to have been a kind of Theatre. I brought away with me a Marble Pedeſtal of a Statue, dug up near to the Square Tower. The Marks where the Feet and the extremities of the Drapery were faſtened to it, are ſtill to be ſeen, and the following Letters finely cut VARIA MARCE. It was given me by the owner of the Ground, who ſaid he had read upon it formerly three other Letters LLA ſince broken off. There are other Inſcriptions, but ſo defaced and ill Cut, that they do not deſerve a particular mention. I have a conſiderable number of Medals, that were found among theſe Ruins; moſt of them have a *Caput turritum* with CARTEIA in very legible Characters. The Reverſe


Cattaia
Lepe
Taron
Guelva
Palos
Zavega
EL CONDADO
R. Saltese
R. de Palos
R. Guadalquivir
SPAIN
S^t Lucar
Rota
Xeres
P. S^t Maria
R. Guadalete
Puerto Real
Cadiz
Pont Suaco
I. S^t Pedro
Conil
Bejer de la Miel
C. Trafalgar


Ximena
R. Jos garganta
R. Guadiaro
COAST OF SPAIN
Bejer de la Miel
R. Barbate
la Barca
Trafalgar
R. Alpariatt
Balonia
Arroyo di Juan Franciſco
Playa de Orimel
Val de Vaca
Tariffa
R. Guadarranque
Rocadillo
Algezeira
Gibraltar
C. Europe
C. Cabrito
Lælius's Fleet
STREIGHTS OF GIBRALTAR
Aſdrubals Fleet
Ceuta P^t
Ceuta
Apes Hill
Alcaſer
C. Spartel
Tangir
COAST OF BARBARIE

verſe is generally a *Fiſh*, a *Neptune*, or a *Rudder*. Towards the *Weſt* there is an eaſy Deſcent to the River *Guadarranque*, which takes its Source at *Caſtellar*, about four Leagues in the Country, and is very deep at *Rocadillo*. There is a Bar where the River falls into the Bay; but it does not hinder the entrance of Veſſels of 15 Tun, to load Charcoal and other neceſſaries, that are ſhipt off from thence for *Ceuta*. Along the ſide of the River there is ſtill a great deal of Stone Work and viſible remains of an Ancient Key. At a ſmall diſtance to the Eaſt, upon an Eminence, there are conſiderable ruins of a Square Caſtle, which appears to have been an ancient Building of very great Strength. The Country People now call it *Caſtillon*, but the *Corrigidor* of that Diſtrict told me he remember'd it called *Torre Cartagena*. The Situation agrees exactly with the Tower of that Name, mentioned in the 274*th* and 316*th* Chapters of the Chronicle of *Alphonſo* XI of *Caſtile*. A Book of great Authority among the *Spaniards*, who are generally of Opinion that it was formed upon the Memoirs of *Fernando Nunnez de Valladolid*, a Favourite and Miniſter of that King, tho' it goes under the name of another Perſon.

All the *Spaniards* who live about the Ruins I have been deſcribing, ſay they are the remains of a City of the *Gentiles* called *Cartago*. The corruption of *Carteia* into a name ſo much more talked of, might eaſily happen in an Oral Tradition of ſo many Years; and I cannot help thinking that, where other Circumſtances concur, an account deliver'd down from Father to Son is an evidence not to be ſlighted, in matters of ſo much obſcurity.

Frequent mention is made of *Carteia* by the Ancient Geographers and Hiſtorians. I build ſo much on two Paſſages of *Livy*, that I am obliged to inſert them at length. (*Livy* does not mention from what Port *Lælius* ſailed for *Carteia*, but by what goes before, it ſeems to have been from *Cartagena*, at that time *Scipio*'s Head Quarters) * Lælius *interim, freto in Oceanum evectus, ad* Carteiam *claſſe acceſſit. (Urbs ea in orâ Oceani ſita eſt, ubi primum è faucibus anguſtis panditur mare)* Gades *ſine certamine proditione recipiendi (ultrò, qui eam rem pollicerentur, in caſtra* Romana *pervenientibus) ſpes, ſicut antea dictum eſt, fuerat. Sed patefacta immatura proditio eſt; comprehenſoſque omnes* Mago Adherbali *Prætori* Carthaginem *devehendos tradit.* Adherbal, *Conjuratis in quinqueremem impoſitis, præmiſſaque eâ, quia tardior quam triremis erat, ipſe cum octo triremibus modico intervallo ſequitur. Jam fretum intrabat quinqueremis, cum* Lælius *& ipſe in quinqueremi, è portu* Carteiæ, *ſequentibus ſeptem triremibus, evectus, in* Adherbalem *ac triremes invehitur; quinqueremem ſatis credens deprehenſam rapido in freto, in adverſum æſtum reciprocari non poſſe.* Pœnus, *in re ſubitâ parumper incertus, trepidavit utrum quinqueremem ſequeretur, an in hoſtes roſtra converteret. Ipſa cunctatio facultatem detrectandæ pugnæ ademit: jam enim ſub ictu teli erant, & undique inſtabant hoſtes. Æſtus quoque arbitrium moderandi naves ademerat; neque erat navali pugnæ ſimilis, quippe ubi nihil voluntarium, nihil artis aut conſilii eſſet. Una natura freti æſtuſque totius certaminis potens, ſuis, alienis navibus, nequicquam remigio in contrarium tendentes invehebat; ut fugientem videres retro vortice intortam victricibus illatam, & ſequentem, ſi in contrarium tractum*

* Lib. xxviii. c. 30.

incidiſſet maris, fugientis modo ſeſe avertientem. Jam in ipsâ pugnâ hæc, cum infeſto roſtro peteret hoſtium navem, obliqua ipſa ictum alterius roſtri accipiebat: Illa cum tranſverſa objiceretur hoſti, repente intorta in proram circumagebatur.

* Lib. XLIII. chap. 3. The other * is, *Et alia novi generis hominum legatio ex* Hiſpaniâ *venit: Ex militibus* Romanis *&* *ex* Hiſpanis *mulieribus, cum quibus connubium non eſſet, natos ſe memorantes, ſupra quatuor millia hominum, orabant ut ſibi oppidum in quo habitarent daretur. Senatus decrevit, uti nomina ſua apud L.* Canuleium *profiterentur, eorumque ſiquos manumiſiſſet, eos* Carteiam *ad Oceanum deduci placere. Qui* Carteienſium *domi manere vellent, poteſtatem fore uti numero colonorum eſſent, agro aſſignato,* Latinam *eam coloniam fuiſſe, Libertinorumque appellari.*

The beſt *Spaniſh* Authors, and *Ortelius* and *Cellarius* truſting to them, take this *Carteia* of *Livy* to be different from that which was the next to *Calpe*, and place it generally about *Conil*. *Rodrigo Caro* in his *Convento Juridico de Sevilla* C. 24. applies the *Carteia* in the XLIII Book of *Livy* to *Rocadillo*, and in Cap. 74. to *Cartaia* near *Lepe*. It is ſurprizing he takes no notice of the Paſſage in the XXVIII Book. For the particular mention of *ad Oceanum*, and *Urbs ea in orâ Oceani ſita eſt*, implies they both relate to the ſame place; perhaps it was becauſe he could not reconcile it with his † Lib. II. c. 1. *Cartaia* near *Lepe*. † *Cellarius* makes *Bæſippo* this *Carteia* of *Livy*. *Bæſippo, quæ videtur* Carteia Livii *eſſe, extra fretum & columnas poſita. Aliam pro* Livio Carteiam *non invenio*; tho' in all the ancient Geographers, *Bæſippo* is mentioned by it ſelf as a diſtant Town. I am ſo far from ſeeing any neceſſity of erecting a new *Carteia* in the Ocean for theſe Paſſages in *Livy*, that I take that in Lib. XXVIII. to be rather a proof that the City there mentioned, ſtood at *Rocadillo*. It certainly agrees much better with that Situation, than with *Conil* or *Carteia* near *Lepe*. It is not to be reconciled with the latter, becauſe that lies *North Weſt* of *Cadiz*, from whence *Adherbal* ſet out for *Carthage*, and is a good way up the Country, on the ſide of a River, and not *in orâ Oceani*. Neither can *Conil* be ſaid properly to be ſituated *Ubi primum è faucibus anguſtis panditur mare*; for the Sea widens conſiderably before it reaches the Capes *Spartel* and *Trafalgar*, and becomes an Ocean where that Town ſtands. It is obſervable that *Mela* applies words of the ſame import with thoſe of *Livy* to the Sea between *Calpe* and *Abila*. *Barbeſul*; *Aperit deinde anguſtiſſimum pelagus*. There is no Harbour at *Conil*, or any other place between Cape *Trafalgar* and *Cadiz*. If the *Carthaginian Quinqueremis* had only *been going into (intrabat)* the Mouth of the Streights between Cape *Spartel* and *Trafalgar*, *Lælius* could not have believed it *ſatis deprehenſum rapido in freto, in adverſum æſtum reciprocari non poſſe*, for there is no ſuch ſtrong Current there; and the action between him and *Adherbal's Triremis*, which were at ſome diſtance behind the *Quinqueremis*, muſt have hapned *Weſtward* of thoſe Capes; which is inconſiſtent with the deſcription *Livy* gives of it; becauſe in that part of the Ocean there are none of thoſe Eddies, that appear to have had ſo particular an effect on both the Fleets, during the Engagement, and are peculiar to the Middle of the Gut. This general miſtake ſeems to have been occaſioned by giving too eaſily into the opinion, that *Livy* underſtood by the *Fretum* all the Sea between the Capes *Spartel* and *Trafalgar*, and the Rock of *Gibralter* and *Apes-Hill*; when it is more probable that he termed ſtrictly ſo only the narroweſt Part, which was generally reckoned to be between the two latter: *Mela. Proxima Africæ & Europæ litiora montes efficiunt Calpe & Abila.* *Pliny* takes *Mellaria* to be neareſt to *Africk*, and therefore places there the *Fretum ex Atlantico mari Lib. 3.* which is an argument his *Fretum* was not the ſame with our Streights, and that he carried the Atlantick Ocean much farther *Eaſt* than the Capes *Spartel* and *Trafalgar*.

Other Authors ſeem to make the Pillars of *Hercules* the Boundary of the Mediterranean and the Ocean. *Marcianus Heracleotes.* Ἐνταῦθα πέρας ἔχει τῆς Βαιτικῆς Ἱσπανίας τὸ μέρος τὸ παρῆκον παρ' ἑκατέρας τὰς θαλάσσας τὰς περὶ τὸν Ἡράκλειον πορθμὸν τυγχανούσας, τήν τε καθ' ἡμᾶς καὶ τὴν ἔξω, τοῦτ ἐστι τὸν Ὠκεανόν. *Hic finem habet Hiſpaniæ Bæticæ pars contingens utraque maria quæ circa fretum Herculeum, tam mare noſtram quam mare exterius, h. e. Oceanum.* Τῆς μὲν Βαιτικῆς τὸ πλεῖστον πρὸ τῆς καθ' ἡμᾶς κεῖται θαλάσσης, τῶν Ἡρακλείων ἐντὸς στηλῶν, μέρος δέ τι παρὰ τὸν δυτικὸν Ὠκεανόν. *Bæticæ quidem pars maxima prætenditur noſtro mari, Herculeas intra columnas, pars vero quædam occidentali Oceano.* *Polybius*[*] Καλεῖται δὲ τὸ μὲν παρὰ τὴν καθ' ἡμᾶς παρῆκον ἕως Ἡρακλείων στηλῶν, Ἰβηρία· τὸ δὲ παρὰ τὴν ἔξω καὶ μεγάλην προσαγορευομένην κοινὴν μὲν ὀνομασίαν οὐκ ἔχει, διὰ τὸ προσφάτως κατοπτεύεσθαι. *Quæ porrigitur ſecundum mare noſtrum portio ad columnas uſque Herculis Iberia nominatur; quæ ſecundum mare externum, quod & magnum appellatur, communem appellationem nondum invenit, quia non diu eſt cum fuit explorata.* *Appian*[†] Ἐμφυλ. παρά τε τὰς στήλας τὰς Ἡρακλείους τὸν ὠκεανὸν ἐπέρων. *Trajecto ad Columnas Herculis Oceano.*

Florus.[††] *In ipſo oſtio Oceani* Varius Didiuſque *legati conflixere; ſed acrius fuit cum ipſo mari, quam inter ſe navibus bellum: Siquidem velut furorem civium caſtigaret Oceanus, utramque claſſem naufragio cecîdit. Quinam ille horror, cum eodem tempore fluctus, procellæ, viri, naves, armamenta confligerent! Adde ſitûs ipſius formidinem, vergentia in unum hinc* Hiſpaniæ, *inde* Mauritaniæ *littora; Mare & inteſtinum & externum, imminenteſque* Herculis *ſpeculas; cum omnia undique ſimul prælio & tempeſtate ſævirent.* Here the Pillars of *Hercules* are made the very Mouth of the Ocean. If you underſtand the *Fretum* of *Livy* in this Senſe, and reckon it to ſignify only the Sea between *Calpe* and *Abila*, and the Ocean to begin from thence *Weſtward*, the Paſſage in the XXVIIIth Book is an accurate deſcription of *Rocadillo*. *Lælius interim freto in Oceanum evectus ad Carteiam claſſe acceſſit. Urbs ea in orâ Oceani ſita eſt, ubi primum è faucibus anguſtis panditur mare.* And allowing *Lælius* to ſet out againſt *Adherbal* from thence, every circumſtance mentioned by *Livy* is ſo eaſy to be accounted for, that it is needleſs to make Application. A Paſſage in *Dio Caſſius*[*] induces me to believe the Veſſels anchored in the *Guadarranque*, and that that River, and not the Bay, was properly *Portus Carteiæ.* Οὐᾶρος δὲ ὑπὸ τοῦ Διδίου περὶ Κραντίαν ἐναυκρατήθη, καὶ εἴγε μὴ προκαταφύγων ἐς τὴν γῆν, ἀγκύρας ἐς τὸ στόμα τοῦ λιμένος ἄλλας πρὸς ἄλλαις προσενεβεβλήκει καὶ περὶ αὐτὰς οἱ πρῶτοι τῶν διωκόντων σφᾶς, ὥσπερ περὶ ἕρμα ἐπτοήκεισαν, πᾶν ἂν τὸ ναυτικὸν ἀπολωλέκει. Varus *vero à* Didio *apud* Crantiam *navali prælio ſuperatus in terram*

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[*] Lib. III.

[†] Lib. II.

[††] Lib. IV. c. 2.

[*] Lib. XLIII.

evaſit, conjectiſque in introitum portûs anchoris, ita ut una ab aliâ teneretur, cum ad eas, tanquam ad ſeptum quoddam, primæ inſequentium naves offendiſſent, periculum totius claſſis amittendæ declinavit. This cannot be underſtood of the Bay, becauſe that is three Leagues over at the narroweſt part, and much too deep for a work of ſuch a Nature, which might eaſily have been effected upon the Bar of the River *Guadarranque.* There is no room to doubt of the emendation *Luis Nunnes*, in his *Hiſpanica*, has made here of Καρτηΐα for Κεραντία; for no ancient Author mentions any other Town or Harbour thereabouts of a name like that; and *Carteia* was the place which held out the longeſt for the younger *Pompey*, and where he kept his Fleets.

Florus in the Paſſage I have already quoted, relating the ſame Action between *Didius* and *Varus*, repreſents in very lively Colours, the very Scene near *Rocadillo*. *Adde ſitus ipſius formidinem, vergentia in unum hinc Hiſpaniæ, inde Mauritaniæ littora; mare inteſtinum & externum, imminenteſque Herculis ſpeculas,* &c. *Hirtius* * ſays, *Cn. Pompeius ad navale præſidium parte alterâ contendit* Carteiam, *quod Oppidum abeſt à* Corduba *millia paſſuum* CLXX. which diſtance, as well as the Circumſtance of *navale præſidium*, agrees with the Situation of *Rocadillo*. The ancient Geographers place *Carteia* next to *Calpe* Weſtward. *Pomponius Mela*, after having given us a perfect Picture of *Calpe*, and deſcribed thoſe laſting Marks in which ſo many Centuries have made no alteration, ſays---- *Sinus ultra eſt, in eoque Carteia. Strabo* † Ἐνταῦθα δὴ ὄρος ἐϛὶ τῶν Ἰβήρων ἡ Κάλπη, &c. ϗ πρὸς αὐτῷ Κάλπη πόλις ἐν τετταράκοντα ϛαδίοις, ἀξιόλογος ϗ παλαιά, ναυϛαθμός ποτὲ γενομένη τῶν Ἰβήρων. Ἔνιοι δὲ ϗ Ἡρακλέους κτίσμα λέγουσιν αὐτήν, ὧν ἐϛὶ ϗ Τιμοσθένης, ὅς φησι ϗ Ἡράκλειαν ὀνομάζεσθαι τὸ παλαιόν, δείκνυσθαί τε μέγαν περίβολον ϗ νεωσοίκους. *Ibi mons* Hiſpanorum *eſt* Calpe, &c. *& ad XL inde Stadia Urbs* Calpe *vetuſta & memorabilis, olim Statio navibus* Hiſpanorum. *Hanc ab* Hercule *quidam conditam aiunt, inter quos eſt* Timoſthenes, *qui eam antiquitùs* Heracleam *fuiſſe appellatam refert, oſtendique adhuc magnum murorum circuitum & Navalia. Caſaubon*, in his Notes on this Paſſage is of Opinion it ſhould be Καρτηΐα πόλις. *Legendum cenſeo* Καρτηΐα πόλις, *nam eam urbem hic intelligi res ipſa docet; & ex eo colligi poteſt, quod toties eam infra nominans, nihil tamen de ejus ſitu alibi dixiſſe reperitur. At* Calpen *Urbem nemini Veterum ne nominatam quidem reperio. Marcianus Heracleotes* makes *Carteia* 50 Stadia from *Calpe:* Either of theſe Diſtances agrees with *Rocadillo*, according to the part of the Rock from which they reckon; for it is above ſix Miles from *Europa* Point to *Rocadillo.*

Bochart ‡ ſtrengthens *Caſaubon*'s Opinion. *Nec fruſtrà* Heraclea Carteiæ *fuiſſe vetus nomen, tanquam ab* Hercule *conditore.* Herculem *enim ſuum* Phœnices Μέλκαρθον *appellabant.* Philo Biblius *ex* Sanchoniathone *apud* Euſebium L. I. *Præparat.* τῷδε Δημαροῦντι γίνεται Μέλκαρθος ὁ ϗ Ἡρακλῆς. *Ex* Demarunte *autem natus eſt* Melcarthus *qui &* Hercules. Μέλκαρθος *autem eſt* מלך קרתא Melech Kartha, *Rex Urbis, i. e.* Tyri. *Idem* Græcis Melicertes *ſive* Palæmon, *Maris Deus, quem* Cadmi *nepotem eſſe fingunt. Hinc* Heſychius *rurſus* Μάλικα τὸν Ἡρακλέα Ἀμαθούσιοι. *Omnino igitur ex* Melcartho, *vel* מלך קרתא Melech Kartha. *Urbs quam ad* Calpen *condidit* Hercules Phœnicius, primo Melcar-

* De Bello Hiſp. verſ. fin.

† Lib. III.

‡ Geog. Sacr. Lib. 1. c. 34.

theia *vocata eſt*, Melech Karthiia, *quaſi* Ἡρακλείαν *dixeris*; *deinde per Aphæreſin* Cartheia *vel* Carteia. *Apud Hebræos frequens eſt hæc Aphæreſis in nominibus locorum compoſitis. Tale* Sittim *pro* Abel Sittim, Salem *pro* Jeruſalem, &c.

I have ſome Medals that were dug up at *Rocadillo*, with the Head and Club of *Hercules* upon them: which ſeem in ſome meaſure to ſupport that great Man's Aſſertion. Upon the Reverſe are Tunny Fiſhes, which according to *Strabo* and *Pliny* abounded formerly near *Carteia*, and are taken in great quantities near the Shoar of the Eaſt Sea, at a ſmall diſtance from *Rocadillo*.

Bernardo Aldrete,* an Author of ſuch Weight, that *Bochart* does not diſdain to copy him on ſeveral occaſions, accounts for the Addition of *eia* to *Cartha*; which, in the *Syriack* and *Chaldæan*, ſignifies *Pulcher*, *Formoſus*, and was affixed to the Name of this City to diſtinguiſh it from the *Cartha* in *Syria* mentioned, *Joſhua* xxi. *ver.* 34.

By all accounts, the *Phœnicians* founded moſt of the Cities on this Coaſt, and probably *Carteia* was one of the earlieſt Settlements; for it lies very near *Africk*, in a moſt inviting Situation, having on one ſide a Bay, and on the other a River, which waters a rich Country. Its height gave it ſtrength and a very beautiful Proſpect; circumſtances which ſeem to juſtify *Aldretes* Interpretation of the latter part of its name.

In the Itinerary of *Antoninus*, it is *Calpe-Carteiam*, not *tanquam duæ urbes diverſæ*, as *Caſaubon* intimates in his Notes on the third Book of *Strabo*, for then it would be *Calpen Carteiam*; nor, according to *Surita*'s Comment on that part of the Itinerary, *ut ſignificet non rectâ iter ex* Suel Carteiam *deduci*, *ſed paululum ad* Calpen *deflecti*; becauſe *Calpe* ſtands at the end of a narrow neck of Land, which projects to the *Southward* a great way from the reſt of the Continent; and conſequently is quite out of the Road from *Suel* to any other place *Weſtward* of it; probably *Calpe-Carteia* is for *Carteia ad Calpen*, to diſtinguiſh it from the other *Carteia* in *Celtiberia* in † *Livy*: For as *Caro* obſerves, there is no neceſſity for the alteration *Sigonius* has made in that Paſſage of *Althæa* for *Carteia*, from the Text of *Polybius*; becauſe *Livy* never mentions the other *Carteia* without adding *ad* Oceanum, *Urbs ea in ora Oceani ſita eſt*; which diſtinction were needleſs, had there been only one City of that Name. *Strabo* ‡ mentions a City called Καρταλίας, and places it near *Saguntum*, which is agreeable to the Situation given this *Carteia* by *Livy*.

I am very much ſurprized that *Mariana*, and ſeveral others, ſhould take the preſent *Gibraltar* to have been the ancient *Heraclea*; when neither *Pliny*, who reſided ſo long in thoſe Parts, *Mela*, who was born there, nor any ancient Geographer or Hiſtorian that I have met with, makes the leaſt mention of ſuch a City thereabouts, except *Strabo*; and he places it 40 Stadia from *Calpe*, at the Foot of which *Gibralter* is ſituated. The *Spaniſh* Hiſtorians give good ground to believe there was no Town upon that Mountain till the *Moors* invaded *Spain* under *Tariff*, who gave it the name it has retained ever ſince. I ſhall not enter into the detail of the reaſons of thoſe Authors, who place *Carteia* at *Tarifa* or *Algezeira*: The true one ſeems to have

* Antiguedades de Eſpana. Lib. II. c. 2.

† Lib. XXI. c. 5.

‡ Lib. III.

have been their not knowing any other place, which agreed better with the old Accounts of *Carteia*, or where the Ruins of a City, which made ſo great a Figure, could be buried; the common practice of Authors who deſcribe places they have not ſeen. This appears to have been the caſe of moſt of thoſe, eſpecially *Mariana*; who, had he been in theſe Parts, would not have been guilty of the overſight he has committed *, where he places two Bays in the *Streights*, one at *Gibraltar*, and the other at *Tariſa*; which error he was probably led into (as it often happens) by another: For giving into the Opinion that *Tariſa* was the ancient *Carteia*, and finding that City placed in a Bay by *Mela*, he concluded there muſt be one at *Tariſa*, which is an open Road, and ſo much expoſed, that in the leaſt bad Weather, the ſmalleſt Veſſels muſt be haul'd aſhore: Which Circumſtance alone is a ſufficient proof of its not being *Carteia*, by all accounts, a famous Harbour.

Tho' there are very great Ruins at *Algezeira*, they are not ſuch as give any room to believe they are the Remains of a *Roman* City: For neither pieces of Marble, nor Inſcriptions are found there, nor any *Roman Coins*. The Circumſtance of *Varus* his ſhutting up the Mouth of the Harbour of *Carteia*, and the diſtance of 40 or 50 *Stadia* from *Calpe*, are not applicable, either to *Tariſa* or *Algezeira*; and if one of thoſe Towns was *Carteia*, to what City belong thoſe Ruins I have been deſcribing? Since all the ancient Geographers make *Carteia* not only the neareſt Town to *Calpe*, but the only one in that Bay. There is better ground to believe *Tariſa* ſtands on the Ruins of another Town, as I ſhall endeavour to ſhew preſently.

But before I proceed to a Deſcription of the Coaſt, it may not be improper to mention ſome Ruins I ſaw at *Ximena*; an Inland Town, about five Leagues *North* from *Gibraltar*, ſituated on a Rocky Hill; at the bottom of which to the *Eaſtward* is a very plentiful Country, waſhed by the *Joſgarganta*, a ſmall Branch of the River *Guadiaro*. On the top of the Hill is the old Town, which by the Arches and Vaults, appears to have been built by the *Moors*. On the right hand Corner of the ſecond Gate of it, there is a coarſe Stone with Mouldings on the Edges, which has the following Inſcription.

L. HERENNIO HE
RENNIANO
L. CORNELIUS HEREN
NIUS RUSTICUS
NEPOS EX TESTA
MENTO POSUIT
NONIS MARTIIS
SEX. QUINTILIO CON
DIANO SEX. QUIN
TILIO MAXIMO COSS.

* Lib. XVI. c. 9.

Rodrigo * *Caro* ſays, he ſaw the beginning of this Inſcription in *Bejer de la miel*; but when I was in that Town, I was informed by a very intelligent Perſon, that there is no *Roman* Inſcription in any part of it. The Author of *Cadiz el emporio del Orbe*, when he inſerts this Inſcription, makes it SEXOVINTILIO CONDIMIO; But the Daſh of the Q is very plain, and the other Word ſeems rather CONDIANO. The *Latin Faſti* in A. U. C. 903. place Conſuls.

SEX. QUINTILIUS GORDIANUS
SEX. QUINTILIUS MAXIMUS.

But the very learned Dr. *Bently* has obſerved to me, that the *Greek Faſti* and *Dio* call him Κονδιανὸς, which reading is confirmed by this Inſcription.

I have brought with me from this Town a piece of Marble, with the following Words upon it.

AUCTINUS CLEMEN
TIS SIBI
ET SUIS BRITTÆ
MATER ANLX
H.S.E. SIT T.T.LEVIS.

I ſaw another on the Wall of the great Church, which ſeems to have been the Baſe of a Statue; The Inſcription is as follows.

RESPUBLICA OBEN
SIS E..LO DATO
DEDI..VIT CURAT
LIBE..OR H.REN
NIORUSTICO H.M.
SINILO RESTITUTO
II VIR.

The manner in which the *Moors* have placed theſe Inſcriptions plainly ſhews the little value they ſet upon them, and there is ſo great a plenty of Stone on the Rock where *Ximena* ſtands, that it is not to be thought they would fetch them for ſuch an uſe, from any diſtant place; which induces me to believe a *Roman* Town formerly ſtood there called OBA.

I do not find any Town of that name in the ancient Authors. *Strabo* † mentions Σένοβα Μαίνοβα ϗ ἄλλαι πλείους, which may poſſibly comprehend *Oba*. The *Geographia Nubienſis*, in the fourth *Clima*, makes a Town called *Rothan*, the firſt Station from *Algezeira* to *Seville*, which perhaps may have been this *Oba*; for it is about a Day's Journey from *Algezeira*, and in the direct Road from thence to *Seville*.

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* Conv. Jurid. de Sevilla, c. 13.

† L. III.

Mariana * places the Cave where *Craſſus* hid himſelf, near *Ximena*; the Marks of it, given by *Plutarch*, are common to moſt others. I went three Leagues in ſearch of it; but the Country People having a notion that there is a Treaſure in it, and not being to be perſuaded that I would take ſo much Pains out of pure Curioſity, would not ſhew me the Way, tho' they acknowledged there were ſeveral ſuch Caves thereabouts. I cannot help taking notice of one very odd tho' trifling circumſtance. The name of the Perſon who owns the Land, where thoſe Caves are, is *Pachieco*, which is very near the ſame with that of the *Spaniard*, who is ſaid by *Plutarch* to have entertained *Craſſus* ſo courteouſly, Πακιακὸς. *Hirtius* † mentions a *Spaniard* of Note, *in provinciâ Bæticâ*, called *Patiecus*. *Quibus præfecit hominem ejus provinciæ notum & non parum ſcientem*, *L. Julium Patiecum*, which was probably the *Roman* Name; and therefore I am ſurprized the *Latin* Tranſlator of *Plutarch* makes it *Pacianus*.

Moſt of the ancient Geographers deſcribe the Coaſt Weſtward of *Carteia* in the following manner. *Julia Traducta*, *Mellaria*, *Bælo fluvius & oppidum*, *Portus Bæſippo*, *Promontorium Junonis*, &c. The Itinerary of *Antoninus* makes no mention of *Julia Traducta*, and *Pliny* places it on the *African* Coaſt, which *Hardouin* ‡ endeavours to account for. *Strabo* calls it *Juliam Jozam*, which as *Bochart* * obſerves, ſignifies the ſame in the *Phœnician* Language, as *Traductam* in the *Latin*. *Ptolemy* calls it *Tranſducta*. He places *Barbeſula* between that and *Carteia*: But all the other old Geographers put both the Town and River of that Name Eaſtward of *Calpe*. I ſaw ſome Ruins on the *Eaſt* ſide of the River *Guadiaro*, four Leagues *Eaſt* of *Gibraltar*; which I take to be the remains of the ancient *Barbeſula*: For I find in the *Cadiz Emporio del Orbe*, mention made of two pieces of Marble, brought from thence to *Gibraltar*; on one of which was M M BARBESULANI. I was credibly informed they were uſed for the Fountain on the Parade. The Letters probably were either ſawed off, or turned inwards; for they do not appear. This *Barbeſula* is probably the *Barbariana* placed in the Itinerary X. M. P. *Eaſt* from *Carteia*.

Pomponius Mela, who was born in thoſe Parts, and, therefore is moſt to be depended on, gives the following account of the Coaſt, according to the Edition of *Gronovius*. *Sinus ultra eſt*, *in eoque* Carteia, *ut quidam putant*, *aliquando* Tarteſſus, *& quam tranſvecti ex* Africâ Phœnices *habitant*; *atque unde nos ſumus*, Tingentera. *Tum* Mellaria & Bælo, & Bæſippo *uſque ad* Junonis promontorium *oram freti occupat*. The text of *Mela* in this place has occaſioned great diſputes among the Learned. *Caſaubon*, in his Notes upon *Strabo*, ſays, *lego autem*——*atque unde nos ſumus* Tingi *contraria Mellaria*, *aut Tingi è regione ſita Mellaria*. *Nam* Tingis *factam hîc à* Melâ *mentionem mihi eſt perſuaſiſſimum*; *primùm quidem veterem lectionem ſpectanti*, *quæ eſt*, *ut dixi*, Cingenteratum; *aut etiam ut in ſuis libris doctiſſimus* Elias Vinetus *reperit* Tingentera; *ut jam de eo dubitari non poſſit*. *Deinde autem video morem* Melæ *hunc eſſe*, *ut locorum in alterâ orâ oppoſitorum mentionem faciat*. *Sic alibi:* Majorem Sabæi tenent partem, oſtio proximam, & Carmanis contrariam Macæ. *Nec moveri quiſquam debet quod alii* Tingin Bæloni *non* Mel-

lariæ

* L. III. c. 2.

† De Bell. Hiſp. princip.

‡ Nummi Illuſtrati. p. 227.

* Lib. I. c. 24.

lariæ *faciunt contrariam. Nam* Bælo *&* Mellaria *ita ſunt vicinæ, ut mirari hoc nemo debeat. Salmaſius*, whoſe opinion is approved by *Bochart*, makes it *Tingis altera, tum Mellaria*, &c. and takes the preceding *tranſvecti* to denote *Julia Traducta. Caſaubon* ſeems to have been once of the ſame Opinion. *Sed a* Strabone *ſtare* Ptolemæus *videtur, qui in hâc* Hiſpaniæ *orâ oppidum quoddam memorat cui nomen* Tranſducta, *in quod ſcilicet collocati fuerint iſti, de quibus nunc loquitur* Strabo; *& de quibus dubitavi aliquando, an hæc* Melæ *verba eſſent accipienda*, In eoque Carteia, ut quidam putant, aliquando Tarteſſus, & quam tranſvecti ex Africâ Phœnices habitant. *Nam videbatur ſatis apertè* Tranſductam Ptolemæi *ϖεριφράζειν. Nunc iis aſſentior qui ad* Carteiam *ea referunt.* The opinion of *Salmaſius* ſeems to be the moſt probable; for *Bælo* and not *Julia Traducta* is ſaid to be over againſt *Tingis. Marcianus Heracleotes* makes the two former about 250 Stadia diſtant from one another, and *Mellaria* is generally placed between them; therefore they could not be ſo near one another, as *Caſaubon* inſinuates. Tho' *Carteia* was originally founded by the *Phœnicians*, it had been erected into a *Roman* Colony long before *Mela's* Time, and therefore he could not very properly ſay *Carteia, quam Phœnices habitant*; and had he intended to take notice of the Founders of that City, it is probable that one, whoſe Stile is ſo pure and accurate, would have made uſe of another word, or at leaſt another Tenſe. Beſides, if *Julia Traducta*, according to *Caſaubon*, is not meant by that paſſage, it muſt have been entirely omitted by *Mela*; which is very unlikely, conſidering he was Born in or near it; and that it is mentioned by *Strabo*, who lived before him, and *Ptolemy* and ſeveral others who were after him; and appears to have been remaining at the time the *Vandals* were in poſſeſſion of *Spain*; for *Greg. Turon.* Lib. II. ſays *Proſequentibus* Alamannis *uſque ad* Traductam, *tranſito Mari*, Vandali *per totam* Africam *ac* Mauritaniam *ſunt diſperſi.* The Letters of *Tingi altera* come nearer the *Tingentera* of *Elias Vinetus*, and the *Tinge Hiera* of *Gronovius*, than *Caſaubon's Tingi contraria* or *Tingi è regione ſita.* The *&* and the *atque*, by making the ſtop at *Tarteſſus* inſtead of *Habitant*, may very well relate to the ſame place; and it is not improbable that *Mela* was deſirous to illuſtrate the obſcure place of his Birth by a Periphraſis, and a name of ſome *Eclat*; tho' it has hapned, the method he took to do Honour to it, has been the occaſion, that we are in doubt even of its name.

I met with two *Medals* of *Julia Traducta* among the Braſs *Spaniſh* Coins; but as I cannot aſcertain where they were found, I will not pretend to form from thence any judgment of the Situation of the Town to which they belong: But I preſume in matters ſo dark, a conjecture may be offered. It does not ſeem very improbable, that *Julia Traducta* ſtood where *Tarifa* is at preſent: The *Spaniſh* Authors reckon that Town to have been built by *Tarif* at his ſecond coming to *Spain*. I cannot ſee what could invite him to ſettle on a Spot, which has neither the convenience of a River, nor a Harbour, and is commanded by a riſing Ground; unleſs he found ſome Tenements ſtanding, or Ruins to ſerve for Materials to build. I have ſeveral *Roman* Coins that were found there after great Rains, in the Common Sewer; which is ſome ſlight inducement to believe it was formerly a *Roman* Town.

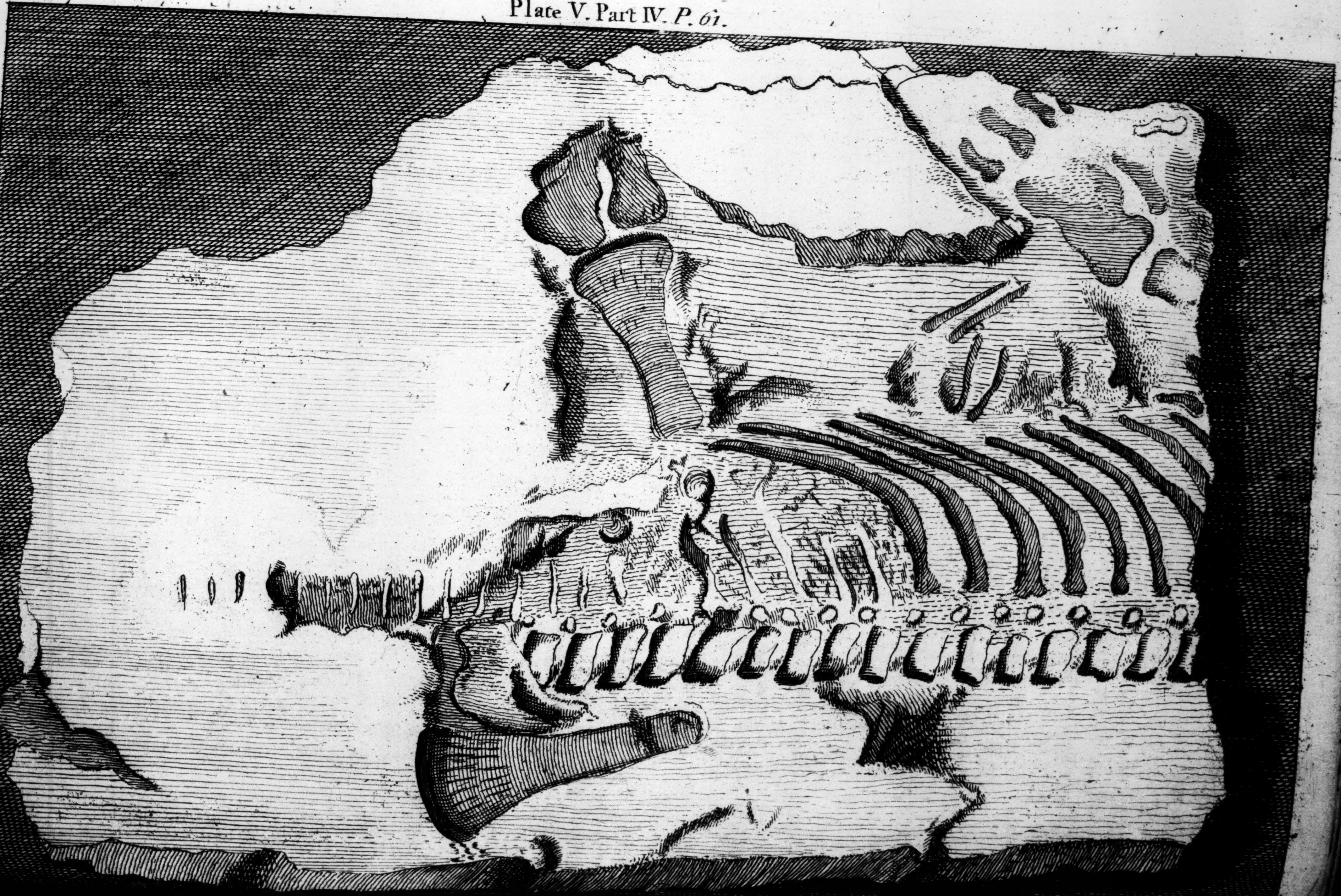
About a League and half to the *Weſt* of *Tarifa*, is a place which goes now by the name of *Val de Vaca:* The Country People have a Tradition among them, that it was once a conſiderable Town, ſince ſwallowed up by the Sea. There is a ſmall Brook called *El Arroyo de Juan Franciſco*, which ſerves to turn ſome Mills, that a Prieſt of that Name was encouraged to build there, by finding an ancient Stone Chanel for the Water. I ſaw ſome other ſmall Ruins, and was credibly aſſured there are viſible remains of an old Town a good way under Water. There is a Shoal almoſt off this place, that runs pretty far in the Sea, on which a *Hamburgher* was loſt ſome Years ago. Perhaps *Mellaria* ſtood hereabouts.

Wherever it was, the Ruins of it muſt be a conſiderable way in the Sea, if credit is to be given to *Pliny*, who upon the Teſtimony of one Born there, reckons only five Miles from thence to *Afric*. Lib. III. whereas it is at preſent five Leagues over at the narow Part. *Caſaubon* is miſtaken in that Note on *Strabo* L. II. where he ſays, *At Maris Mediterranei oſtium vix LXX Stadia latum eſt* ᾗ ϛενώτατον.

I cannot help obſerving that the beſt Hony in all *Spain* is made in theſe Parts, and that the ſame cauſe to which the ancient *Mellaria* ow'd its Name, ſtill ſubſiſts, and has given a modern Appellation to ſeveral places hereabouts, as *Playa de Orimel*, *Rio de la Miel*, *Bejer de la Miel*. The latter of theſe is generally reckoned by the *Spaniards* to be the old *Mellaria*, for no other reaſon, that I can ſee, but the Name. For it is at leaſt two Leagues from the Coaſt of the Streights, and, by what I could judge when I was on the Spot, as near the Ocean, and therefore may as well be aſcribed to the one as the other. Whereas *Mellaria*, according to all the old Geographers, was ſituated on the Sea-ſide in the Streights, and is reckoned by *Pliny* the neareſt Town to *Afric*; a plain proof that it was not what is now *Bejer de la Miel*.

About a League and half further *Weſt*, in a ſmall Bay, there are very great Ruins, which appear evidently to be the remains of a *Roman* Town. A League *Eaſtward* from that place, upon an Eminence, are to be ſeen the Quarries from which the Stone was fetched for building it; and all the way from thence are large remains of an Aqueduct, of which in ſome places there are entire Arches ſtill ſtanding. Among the Ruins of the old Town, I ſaw the Body of a *Roman* Statue of fine Alabaſter, ſomething bigger than the Life. Our Guide ſaid his Father had ſeen it entire; but as it was an Idol of the *Gentiles*, they, like good Catholicks, had broken it in pieces. He likewiſe told us that Urns of old Coins had been found there; but not being Current in *Spain*, they had thrown them away. The place is called *Balonia*. It is over againſt *Tangier*, and frequently infeſted by the *Moors* from thence; on which account it is uninhabited. A ſmall River, called *Alpariate*, runs by it: all which circumſtances correſpond with the ancient accounts of *Bælo*. I have a Medal that was given me at *Tarifa*, with the following Letters upon it BAILO, which probably belonged to this City,

Plate V. Part IV. *P. 61.*



called by *Ptolemy* Βαίλων. *Martianus Capella* Lib. VI. mentions it under the name of *Velonenſis Bæticæ Civitas.* The Itinerary of *Antoninus* places *Bælo* VI. M. P. *Weſt* of *Mellaria*, which is about the diſtance of theſe Ruins from *Val de Vaca.*

About five Leagues farther is the Cape of *Trafalgar*; the ſight of which immediately brought to my mind *Mela*'s deſcription of it. *Illud jam in Occidentem & Oceanum obliquo jugo excurrens, atque ei, quod Ampeluſium eſſe diximus, adverſum,* &c. Near the Capes Point are the Ruins often mentioned by the *Spaniſh* Authors, under the name of *Aguas de Mecca.* I was not there, but was aſſured at *Bejer de la Miel*, that there were ſtill ſome Ruins on the Shore, and more in the Sea, that run all along under the Cape; particularly remains of a Mole, which muſt have made it a tolerable Harbour. Theſe Ruins ſeem to be the remains of old *Bæſippo**. Mela *Bæſippo uſque ad Junonis promontorium, oram freti occupat.*

* Plin. L. III. Portus Bæſippo.

The placing of Watch-Towers along the Coaſt of *Spain* to alarm the Country, upon any Deſcent, ſeems to have been a practice of a long ſtanding. *Livy* † *Multas & locis altis poſitas turres* Hiſpania *habet, quibus & ſpeculis & propugnaculis contra latrones utuntur: inde primo, conſpectis hoſtium navibus, datum ſignum* Aſdrubali *eſt*, &c.

† L. XXII. c. 19.

The Impreſſion of a Sceleton in a Stone, by Dr. Stukeley. *n.* 360. *p.* 963.

X. The Stone was found at *Elſtone* near *Newark, Nottinghamſhire*: It is a blue Clay Stone, the ſame as (and undoubtedly came from) the neighbouring Quarries of *Fulbeck*, or thereabouts, upon the Weſtern Cliff of the long Tract of Hills extending quite through the adjacent County of *Lincoln*. It lay, time out of mind, at the ſide of a Well near the Parſonage-Houſe, where it had ſerv'd for a Landing-place to thoſe that drew Water; but upon removal, the Under ſide exhibited this unuſual Form, and was laid up by Mr. *South*, the Rector, in his Garden for Curioſity-ſake. Where the remaining part of the Stone, which contain'd the Upper-part and Continuation of the *Sceleton*, or that which was the other ſide, and tally'd with it, may be, is now utterly unknown: but upon view, I am perſuaded, it cannot be reckon'd Human, but ſeems to be a *Crocodile* or *Porpoiſe*. There are Sixteen *Vertebræ* of the Back and Loyns very plain and diſtinct, with their Proceſſes and intermediate Cartilages. Nine whole or partial Ribs of the Left-ſide, the *Os Sacrum*, *Ileum in ſitu*, and two Thigh-Bones diſplac'd a little, the Beginnings of the *Tibia* and *Fibula* of the Right Leg; on one Corner there ſeem to be the *Veſtigia* of a Foot with four of the five Toes, and a little way off an entire Toe, now left perfect in the Stone: there are no leſs than Eleven Joints of the Tail, and the Cartilages between them of a White Colour diſtinguiſhable from the reſt. We ſhould impoſe upon our Senſes, to queſtion, whether theſe be the real Reliques of an Animal; for the very Bones themſelves are now to be ſeen as plainly, as if preſerv'd in an *Ægyptian* Mummy. Its remarkable, that all the Stone Pits about the Country whence this came, abound with prodigious Quantities of Shells, and the like, and the greateſt part of the Subſtance of the Stone is a Compoſition of them. There are many Accounts of them in the *Tranſactions*, and this Stone has

Plate 5.

many Shells of different kinds in it. Sir *Hans Sloan* has a Fiſh-Sceleton, amongſt his immenſe Treaſure of Curioſities, found near this Place, given by the Duke of *Rutland*. If we look upon a Map of the Country, and obſerve the *Lincolnſhire Alps* which I ſpoke of before, how they run 50 Miles North and South, and on the Weſt ſide are ſteep and rocky, we may ſee the Reaſon why theſe Quarries ſhould be ſo ſtuft with them; for it is juſt to conceive, that upon retiring of the Waters of the Deluge from the Superficies of this Country, into the Eaſtern Seas, theſe heavy Bodies met a full ſtop, and were intercepted by this Cliff, which has retain'd ſuch vaſt Quantities of them ever ſince: whilſt thoſe which fell upon common Mold are moſtly rotten, and now loſt.

Sir *Iſaac Newton*'s Doctrine of the Attraction of the Particles of Matter, according to the Quantity of its Solidity, Proximity, and Surface, eſpecially that it is infinitely greater in the point of Contact, upon which depends its Coheſion and all the Varieties of Phyſical Action, will eaſily direct us to a Notion of Petrifaction. We learn how a proper Degree of Heat or Cold, Moiſture, Motion, Reſt and Time, promote this Principle, from the common Experiments of Cryſtallization and Freezing even before the Fire, and in many Chymical Mixtures. Whence we cannot be ignorant of Stone growing in the Quarries gradually, not by any fanſied Vegetation, tho' there is ſomething like it in Corals, but generally by Appoſition of Parts to Parts, as is notorious in the *Fluors* of ſubterraneous Grotts and Caverns. So that we have no reaſon to doubt but what was Clay, Sand, or Earth 3000 Years ago, may now be Stone or Marble, according to the Proportion of Concurrence of ſuch mentioned Cauſes. This will perſuade us that the now barren and rocky Plains of the Countries of *Syria*, *India*, and *Arabia*, are owing to Natural Cauſes, as well as an immediate Curſe of God for the Diſobedience of its ancient Poſſeſſors his peculiar People, becauſe the ſame is obſervable of the famous Countries of *Greece* and *Africa*, warm Regions ſo renowned for Fertility in antient Authors. Wherefore there may be ſome likelyhood in the Opinion of thoſe who think that in many Ages the whole Face of the Globe may become one great Rock. Dr. * *Plott*, gives an Account of a *Tumulus*, now a perfect Mount of Stone: and upon St. *Vincent*'s Rock near *Briſtol* are Fortifications now become ſolid Cliff. I remember, about ſix Years ago, Mr. *Ralph Widdrington*, Brother to the Earl of that Name, ſhew'd me many human Bones taken from whole Sceletons, with Britiſh Beads, Chains, Iron Rings, Braſs Bitts of Bridles, and the like, which were dug up in a Quarry, near the Seat of the Family, at *Blankney*, *Lincolnſhire*; which very probably was plain Mold when theſe old Corpſes of the *Britons* were interr'd; and ſince then I ſaw many human Bones and Armour, with *Roman* Coins, *Fibulæ*, *&c.* found in a Stone-pit in the Park at *Hunſtanton*, *Norfolk*; which were conjectured to have been buried in Earth after a Battle. From whence we may judge it a vulgar Miſtake, when in the Ruins of old Caſtles and Walls, we admire the Tenacity of the Mortar, and are apt to praiſe our Anceſtors, for an Art which we ſuppoſe now loſt; when doubtleſs the Strength of the Cement is owing

* *Hiſt. of* Oxfordſhire.

to the Length of Time: and in future Ages our Modern Buildings may obtain the ſame Judgment.

From all which Inſtances, I only deſire to infer the antient ſtate of theſe Cliffs, where this Sceleton was, and Shells are daily found, intimately mixt in the Subſtance of the Stone, to have been formerly of a ſofter Conſiſtence, capable of admitting them into its Bowels, and to have immur'd them as part of itſelf; and that Earth which now is manageable by the Plough, may poſſibly in time aſſume the ſame Denſity, at leaſt very little below the Surface; for in this very Cliff the upper *Strata* are yet Clay, growing harder as deeper. What Creature this has been, for want of a Natural Hiſtory of Sceletons, we cannot poſitively determine; but generally find the like to be amphibious or marine Animals. Why ſuch rather than many others, ſhould chance to be thus entomb'd, may be thought, becauſe they were able much longer than Terreſtrial Animals to live in that World of Waters, even till they began to abate and fall away into their deſtin'd Receptacles; ſo that while the Bodies of the reſt, ſoon periſhing, were corrupted, and their Bones ſeparated and diſpers'd much earlier; this Sceleton, with others of its like, fell entire into the Fiſſures of this Bed of Clay, which has ſince turn'd into Stone.

Roman *Antiquities found near the* Devizes, *by Mr.* Clark. *n.* 268. *p.* 758.

XI. *Dec.* 5. 1699. One digging in a Ground of Sir *John Eyles*, near the *Devizes* in *Wiltſhire*, about two Foot under the Surface, took up a Pot of a pretty narrow Mouth, about 18 Inches in its greateſt Circumference, and 10 Inches deep; the Clay of a bluiſh Color, and of ſuch ſtrength and compactneſs, as it ſeem'd little injur'd by time; contain'd ſeveral hundred Pieces of ancient *Roman* Coin, by different Emperors, with great variety of curious Figures, and Devices on the Reverſes. The moſt were of Copper, and but very few of mixt metal. A great number had the Characters effac'd, but the legible were the faireſt I ever ſaw. 'Tis obſervable many of the ſaid Pieces were gilt with Silver, which on ſeveral that I have ſeen ſeem'd very little impaired, tho' they had lain under ground for ſome Ages, and appear'd as much Canker'd as the reſt. I have among ſeveral others two very odd Pieces; one of them gilt; on one ſide a Womans face, with this Inſcription SALONINA AUG. the other a Woman's face, part of the Inſcription HE-LENA, the remaining Characters I cannot decypher. On the Reverſe PAX PVBLICA. This latter is of a mixt metal reſembling Braſs, of the largeneſs of a Silver-penny ungilt. About the ſame time, and within a few yards of the ſame place, were found ſome Pots, made of a very firm and durable Clay, of pretty ſtrange Figures, and different Earth, two of which I have by me, one of them ſomewhat reſembling an Oyſter-pot, is about $\frac{31}{16}$ of an inch thick, 9 inches in Circumference, and $5\frac{1}{2}$ in depth, and for ſtrength and compactneſs, ſcarce to be parallelled by any now made; the other is one half of the Pot, in which the Treaſure was found. There is likewiſe another Pot in the hands of another Perſon, of about 11 Inches circumference, and $3\frac{1}{3}$ deep, wherein was found a whitiſh Powder, ſuppoſed by the owner to be the aſhes of humane Bones, and therefore

fore by him taken taken to be an Urn. But on Experiment made on the ſuppoſed Bone aſhes, by putting a ſmall portion into the bowl of a clean Tobacco-pipe made glowing, it ſoon appear'd to the contrary; for the ſaid matter immediately kindled into a bright flame, and ſent forth a ſcent ſomewhat like that of hoofs or horns, tho' it had a very fragrant ſmell before. I am told moreover, that 'tis very uſual in theſe parts of the Kingdom to find various ſorts of ancient Earthen Ware, ſome exceeding *China* in fineneſs. I remember I once ſaw a Piece in the hands of an Apothecary in *Caln*, that had been finely gilt with Gold.

Antiquities and Inſcriptions lately found in Scotland *and* Ireland. *By Mr.* Lhwyd. *n.* 269. *p.* 790.

XII. Fig. 3. A *Roman* Inſcription from *Hadrian*'s Wall by the Kirk of *Kilpatric*. *Imperatori Cæſari Tito Ælio Hadriano Antonino, Auguſto, Pio, patri patriæ, vexillatio legionis ſextæ victricis p. foſſam per ter mille* & DCLVI. *paſſus.*

4. An *Iriſh* Inſcription on a ſtately Croſs, carv'd on all ſides. 'Tis at *Munſter Boys*, near *Drogheda*.

The two Cats and the Inſcription we know not what to make of.

5. Another at the Abbey of *Cluinmacnos* in the County of *Roſcommon*.

Or Angilla Giarain.
Pray for the ſake of *Giarain*.

Plate 4.

6. A *Pictiſh* Monument near *Edinburgh*, *In oc tumulo jacit veta F victi.* This the common people call the *Ket ſtean*. Note, that the *Britiſh* names beginning with the letters Gw., began in *Latin* with v, as we find by *Gwytheyrn*, *Gwytheuir* and *Gwythelin*; whom *Latin* Writers call *Vortigernus*, *Vortimarus* and *Vitellinus*. So I ſuppoſe this perſons name was *Gweth* (or *Geth*) of which name were divers Kings of the *Picts*; whence the vulgar name of *Ket-ſtone*.

7. A Monument of *Kadran* Prince of *North Wales*, about the midſt of the ſixth Century. *Catamanus Rex ſapientiſſimus opinatiſſimus omnium Regum.* This is above the Church door of *Lhan Gudwaladr* in *Angleſey*, and is a confirmation of the Authority of *Geofrey* of *Monmouth*, who makes Prince *Caduan* the Grandfather of our laſt King *Cadwaladr*.

8. A *French* Inſcription at *Bullifont* Abbey in *Ireland*. *Phelip de la Chapele Ghyt ici, Deu de ſa alma eyit mercipte.*

9 & 10. Two *Iriſh* Inſcriptions on the Tombs of *Scottiſh* Princes at *Y Columb Kil* in the *Hebrides*. The 1ſt ſignifies, Pray for *Eogain* (or *Eugenius*) the 2d, Pray for *Ilſata*.

11. An Arrows Head of Flint, commonly call'd *Elf-Arrow* throughout *Ireland* and *Scotland*, where they are fully perſwaded the *Elves* often ſhoot them at Men and Beaſts. This is ſet in Silver, and worn about the Neck, as an Amulet, againſt being Elf-ſhot.

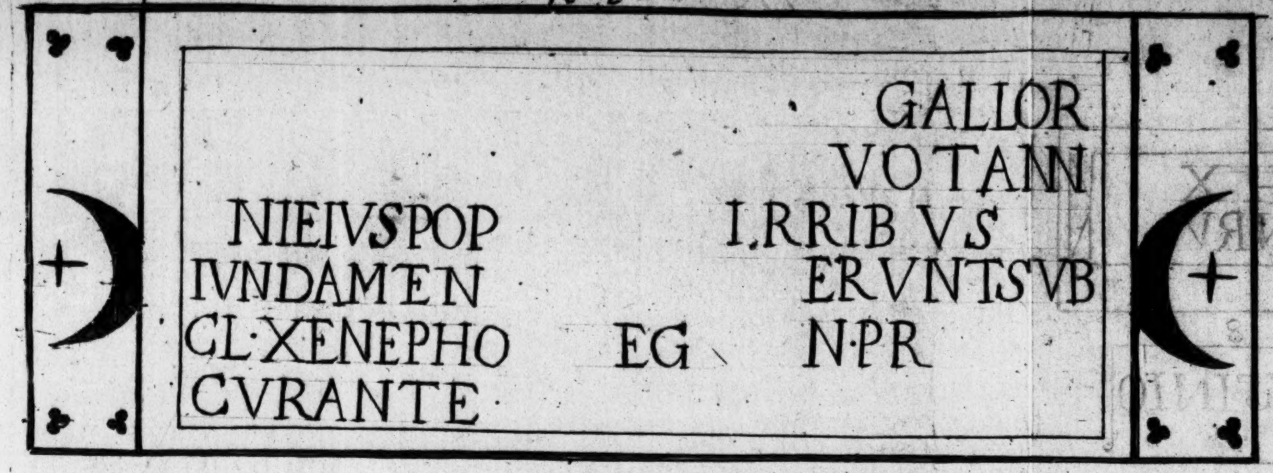
——*In* Yorkſhire. *By Mr.* Hunter. *n.* 278. *p.* 1129.

XIII. 1. A *Roman* Station at a Village call'd *Ebcheſter* in the County of *Durham*, has been ſurrounded with a Wall of hewn Stone, and ſeems to have been an exact ſquare of about 200 yards on every ſide: here have been

Suburbs

Place VI. Part IV. P. 65.

No. 1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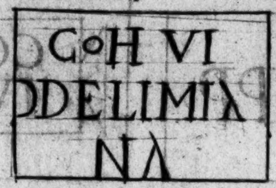
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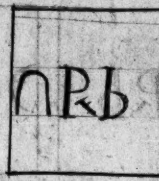

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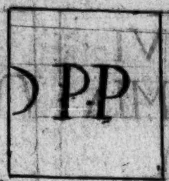

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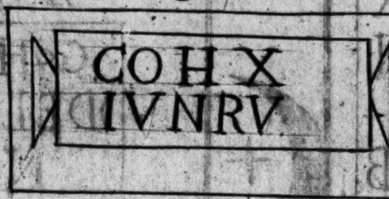

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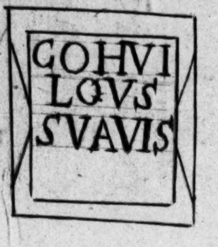
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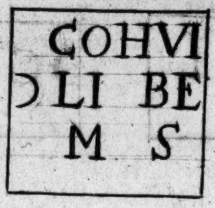
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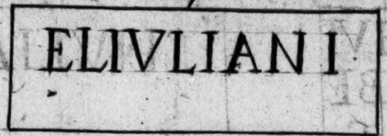

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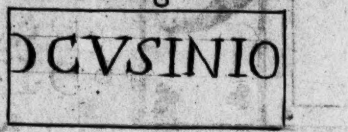

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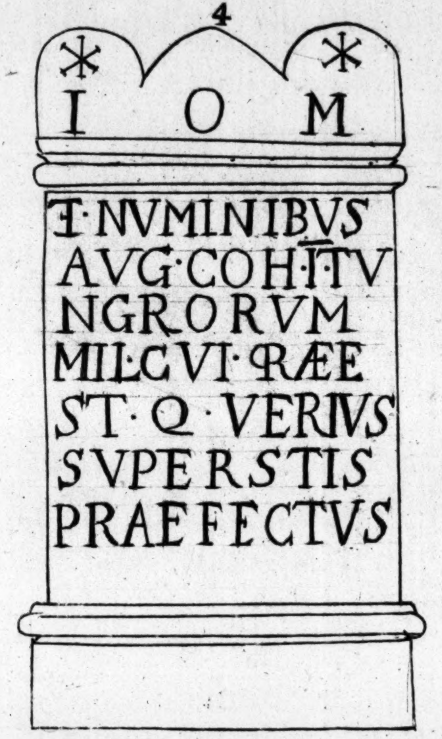
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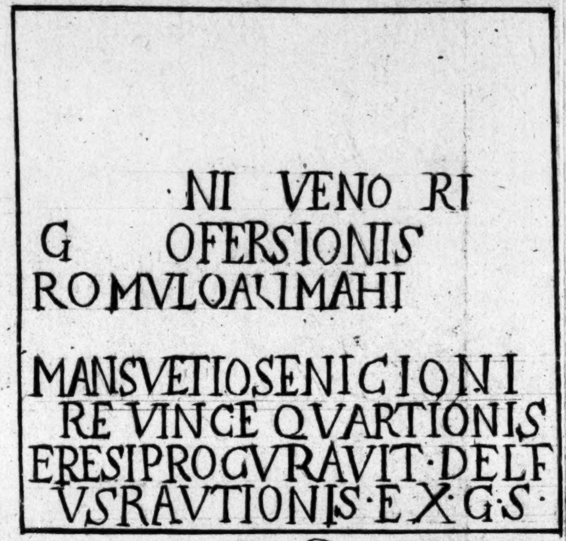
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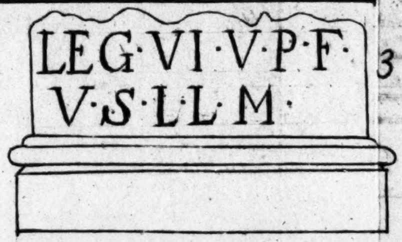
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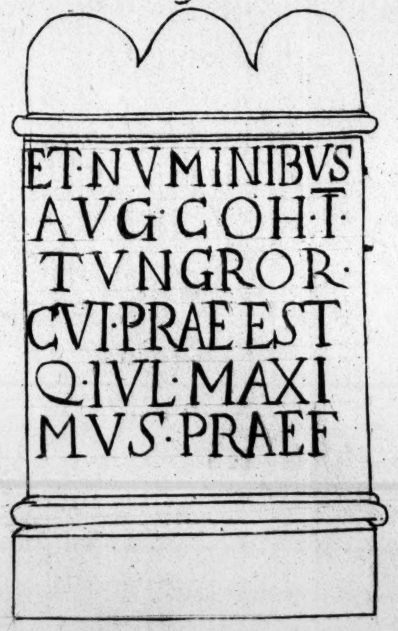
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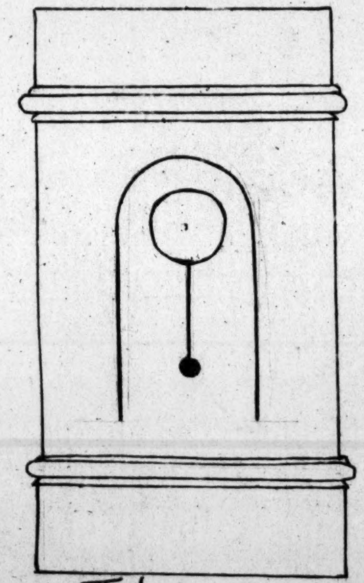

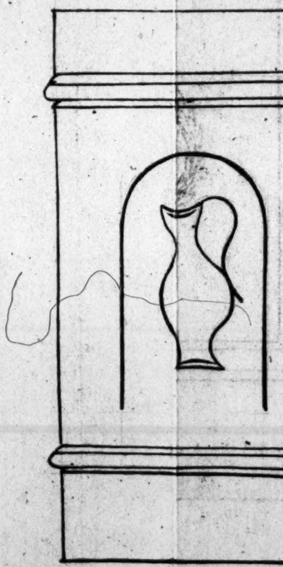

Tab: 1.

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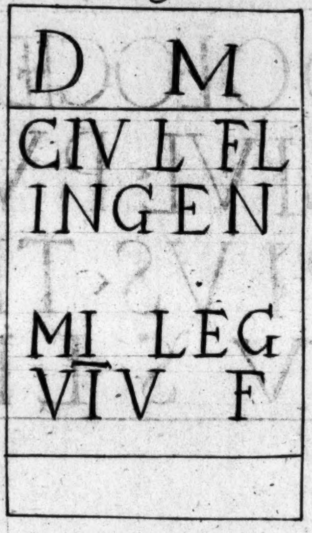
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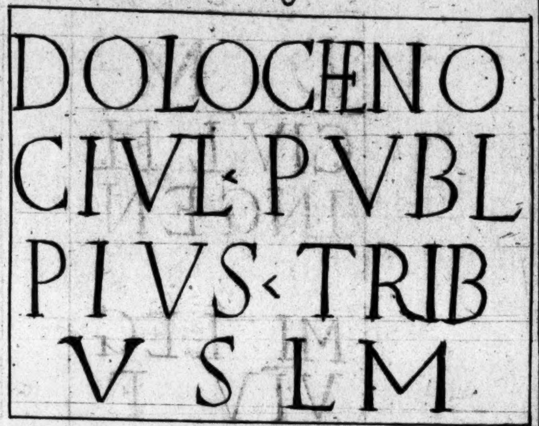
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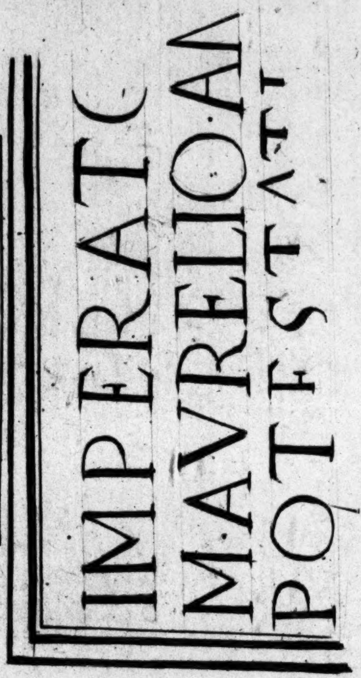
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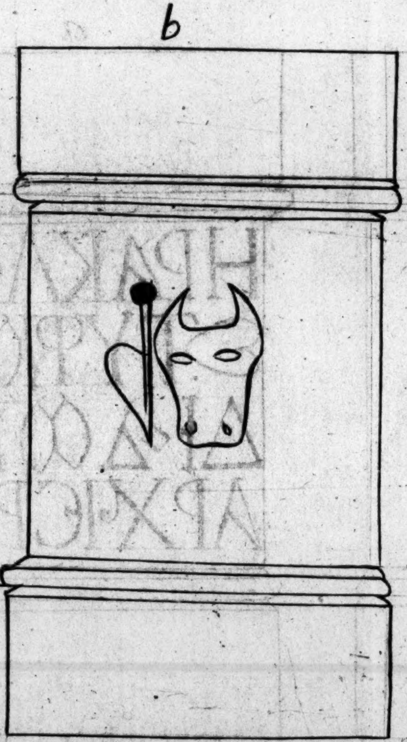
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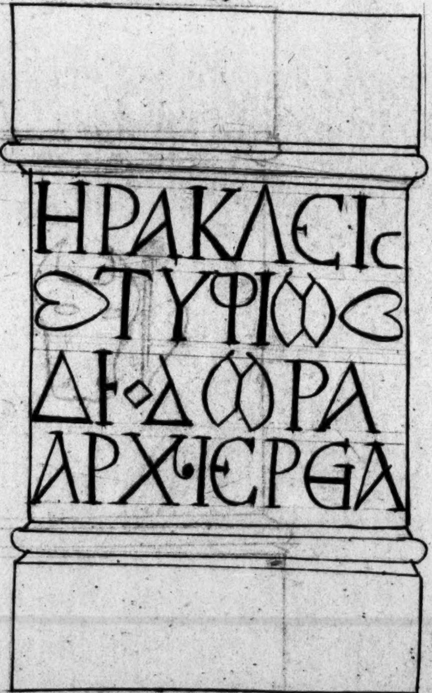
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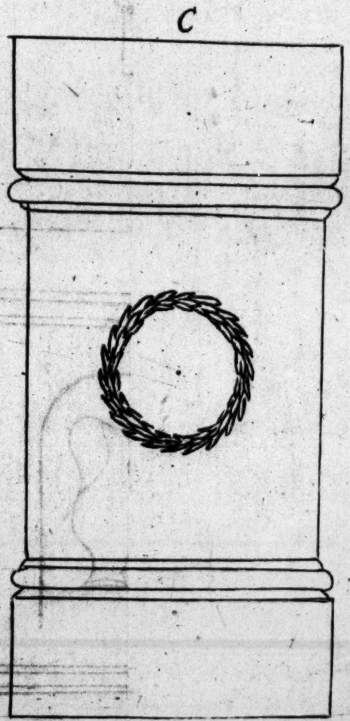
c



Tab: 2.

1

Suburbs towards the Weſt, South, and perhaps Eaſt, of a conſiderable extent: but towards the North the Wall has ſtood upon the top of a ſteep bank, under which runs the River *Derwent*, in which not long ſince was found a long Altar, but its Inſcription is defaced: as alſo a leſſer Stone, with this word HAVE, not on the front, but one ſide; this Stone is in my poſſeſſion. There is another (which is uſed as a Grave-ſtone) it lies before the Church-door, which by the Engraving of a Man from the Breaſt upwards in a *Roman* dreſs, ſeems to have been *Roman*. Theſe are all the Stones I can meet with that have ever had any *Roman* Inſcription. The Inhabitants all confeſs they have dug up many Inſcriptions, but (becauſe no body there underſtood them) they always broke them: and they add, that in moſt places they plainly diſcern two different foundations of ruin'd Houſes, and moſt Stones thus dug up are ting'd of a deep red colour, undoubtedly by Fire. That part of the Village which ſtands within the Walls is call'd the *Mains*, and there are the moſt ruins: here are many Tiles dug up of a red Clay, but not one entire.

About twenty years ago, ſome out of a Project of finding a Treaſure, and prompted forward by the Tradition of an Iron Gate, ſuppoſed to be about eighty yards from the place where they made the firſt attempt, began to undermine an old Foundation ſtill viſible on a Hill ſide, and after they made a ſmall progreſs found a conſiderable quantity of melted Metal, which at firſt view they ſuppoſed had been Silver, but upon a ſecond examination it proved to be no more than Pewter, which diſcouraged the Undertakers ſo much that they deſiſted from further Enquiry.

2. Theſe Inſcriptions, I doubt not, will find a favourable reception; tho' 'tis to be confeſs'd, ſome of them are not ſo perfect as I could have deſired; and moſt of the words in that mark'd Tab. I. No. I. are ſo artificially erazed, that I am apt to believe it has been thus defaced upon ſome Revolution in the *Roman* Government. This, (with ſeveral more, beautify'd with Inſcriptions and Engraving, but which are now taken away) was dug up ſome time ago in a Field called the *Bower*, it is about half way between the *Roman* Wall and South *Tine*, and is near two miles Weſt from *Buſie gap*; here has been a *Roman* Garriſon kept, it has been ſurrounded with a ſingle Wall, and is ſquare; 'tis nothing now but heaps of Stones, overgrown with Buſhes. *Plate* 6.

Some years ago, on the Weſt ſide of this Place, about fifty yards from the Walls thereof, there was diſcover'd under a heap of Rubbiſh a ſquare Room ſtrongly vaulted above, and paved with large ſquare Stones ſet in Lime; and under this a lower Room, whoſe Roof was ſupported by rows of ſquare Pillars of about half a yard high: the upper Room had two niches, like (and perhaps in the nature of) Chimneys on each ſide of every corner or ſquare, which in all made the number ſixteen; the Pavement of this Room, as alſo its Roof, were tinged black with Smoak. The Stones uſed in Vaulting the upper Room have been marked as our Joyners do the Deals for Chambers; thoſe I ſaw were number'd thus, X. XI. XIII. The man who farms this ground preſented me with a winged Image; it has been about three Inches long, but now wants the Head and Feet.

The other Inſcriptions were all found near the *Houſeſteads*, a Place ſo called from the abundance of Ruins; this is about half a mile from *Buſy-gap* towards the Weſt, and is placed juſt within the *Roman* Wall; among the Ruins I found ſeveral Pedeſtals, two or three Pillars, two Images, but ſomewhat defaced. The Stone Tab. 1. No. 2. lies againſt a Hedge a quarter of a mile from this place. That marked Tab. 1. No. 3. tho' only part of an Altar, I thought worthy tranſcribing, becauſe I am in hopes of recovering the other part as ſoon as Harveſt is over, this part having been tore up by the Plough. The two Altars Tab. 1. No. 4. and 5. are very legible; I found them on a riſing ground South of the *Houſeſteads*; they call it *Chapel-hill*, and ſuppoſe a Foundation, which is viſible there, to have been a Chapel; and ſay that within the memory of their Fathers they uſed to bury their dead here.

3. I found *Watlingſtreet* very viſible from near *Ebcheſter* almoſt to *Corbridge*, which is about ſeven miles: here beyond expectation I met with this Altar marked Tab. 2. a. I drew both ſides of it, b. and c. as well as I could; on the top it is hollow at leaſt eight inches deep: the Inſcription is all legible except the ſecond and laſt letters in the firſt line, the ſecond and third in the third line, and the third in the laſt, which are a little doubtful; the Altar is at preſent in the Church-yard, it has been there a long time.

The Fragment d. I found in the front of a Houſe in the ſame Town, it is ſtill ſufficient to ſhew the real value which ought to have been ſet upon the Inſcription, if it had been entire: I was very ſenſible at firſt view that Hiſtory would receive ſome light from this, if perfect; and in order to retrieve the remaining part (which I am perſwaded is ſtill buried in the Ruins) I profer'd any reaſonable gratification to whoſoever would undertake to procure it for me, but had the ungrateful anſwer, that the perſon who found this being dead, no other body could go to the place where it was formerly digged up. This, plainly ſhews the irretrievable loſs Learning ſuſtains by the ſluggiſh neglect of ſome Men.

From hence I travell'd upon this Street almoſt to *Reſingham*; it is very viſible all this way: about a mile South from *Reſingham* there is a Pillar of about eight foot in length, which has ſtood by the way ſide, but is now fallen: At this Place I was ſhewn the Inſcription c. in a Wall on the inſide of a Houſe, I got a Medal which was found here a year ago, 'tis a Braſs one, the Emperor's name worn out, AVG PIVS very legible, but by the figures of other Medals I take it to be *Antoninus*; on the Reverſe a Wolf, without any Inſcription.

The next *Roman* Town I viſited was *Rocheſter*; *Watlingſtreet* is very viſible ſome part of it, but how far I cannot tell, not having traced it. I found the Altar f. near this place. I cannot ſay this is the largeſt, but think it has been one of the beſt fortified Places the *Romans* have been Maſters of in the North: and indeed it ſtood in need of being ſo, ſince it was not only a Frontier Town, but, as *Maeſtricht* is at preſent, was ſurrounded by Enemies.

From this Place I return'd to the *Roman* Wall at *Carrow*, between which and *Walwich* the Wall has been repair'd, and fronted with its old Stones again, upon which I found the Inſcriptions Tab. 2. No. 1, 2, 3, 4, *&c.*

XIV. There was found at Mr. *Mont. Giles*'s a remarkable Lead Coffin, which by the Circumſtances, ſeems to have been for a Perſon of Quality; 'twas nine Foot deep in the Ground, whereof 6 were Clay, and 3 a black Earth; the Lead Coffin, which was about ſeven Foot long, was incloſ'd in a prodigious ſtrong one, made of Oak Plants about two Inches and half thick, which, beſides the Rivettings, were tack'd together with Brags and great Iron Nails, ſome of which I pull'd out of the Planks, and have by me; they are four Inches long, the Head not Diewiſe as the large Nails now are, but perfectly flat, and an Inch broad: I have one ſomewhat different; the Nail itſelf is half an Inch broad and thin, ſomewhat in form of a Wedge, and the Head not round as the others, but ſomewhat like the modern Draw-nails; but thoſe old ones are generally ſquare, the four ſides of an equal breadth. Many of them are almoſt conſum'd with ruſt, and the outſides of the Planks, but the Heart of the Oak is firm, and the Lead very freſh and pliable; whereas one found about a Year ago, is brittle, and almoſt wholly conſumed, having no Planks to guard it: But what I was moſt ſurprized at, was, that the Bones ſhould be entire, tho' probably interr'd 1500 Years ago; for 'tis above ſo many Centuries ſince their Cuſtom of Burning gave place to that more natural of Burying their Dead; which, according to Monſieur *Muret*, was re-introduced by the *Antonines*. I have a Thigh-bone (which is wonderful light) and the lower Jaw, which was furniſhed with all the Teeth, but ſome of them are ſince ſtoln out; but tho' the Bones are light, the double Coffins were ſo heavy, that they were forced to drag them out with a Team of Horſes.

A Leaden Coffin found near York, *by Mr.* Thoresby. n. 296. p. 1864.

XV. 1. About 40 Perches diſtant North from a ruinous Wall, call'd the *Old-Work of Wroxeter*, once *Uriconium*, a famous City in *Shropſhire*, in a piece of Arable Land, in the Tenure of Mr. *Bennet*, he obſerved, that altho' theſe Fields had formerly been fertilized, and made very rich by the Flames and Deſtruction of the City, yet a ſmall ſquare Parcel thereof to be fruitleſs, and not to be improved by the beſt Manure. He then gueſſing the Cauſe of Sterility to be underneath, ſent his Men to dig and ſearch into it; but the Soil being then unſown, caus'd them to miſtake, and ſearch in a wrong place; where they happen'd upon bottoms of old Walls, buried in their own Rubbiſh, (being ſuch are often found in thoſe Fields;) and the Inhabitants digging one of them up, for the benefit of the Building-Stone, were thereby guided to the Weſtern-Corner of the ſaid unprofitable Spot of Land: Where they found (near the Foundation) a little Door-place, which, when cleanſed gave entrance into the Vacancy of a ſquare Room, walled about, and floor'd under and over, with ſome Aſhes and Earth therein. This was built in times paſt (as ſome ſuppoſe) for a *Sudatory* or *Sweating-houſe* for *Roman* Soldiers; being ſet with 4 Ranks of ſmall Brick Pillars,

A Roman Sudatory in Shropſhire, *by Mr.* John Lyſter. n. 306. p. 2226.

8 Inches ſquare, and laid in a ſtrong ſort of very fine Red Clay; each Pillar being founded upon a Foot ſquare Quarry of Brick; and upon the head of every Pillar was fixed a large Quarry of 2 Foot ſquare, hard almoſt as Flint, as moſt of thoſe *Roman* Bricks are, and within as Red as Scarlet, and fine as Chalk. Theſe Pillars were to ſupport a double Floor, made of very ſtrong Mortar, mixed with coarſe Gravel, and bruiſed or broken Bricks: The firſt of theſe Floors was laid upon the large Quarries, and when dry, the ſecond Floor was laid upon it.

But firſt there was a Range or Rank of Tunnel-Bricks, fixt with Iron-Cramps up to the Wall within, with their lower ends level with the under ſides of the broad Quarries, and their upper ends with the ſurface of the upper Floor; and every Tunnel had alike two oppoſite Mortice-holes, one on either ſide, cut through for a croſs paſſage to diſperſe the Heat amongſt them all.

Fig. 1. A. B. C. D. is the Ground Plat, on which the Pillars of Brick ſtand.

Plate 7. *Fig.* 2. E. F. is one of the ſaid Bricks; which are in number 24.

Fig. 3. G. H. I. K. is the Ceiling of ſquare Tiles, which lye upon the Heads of the ſquare Pillars.

Fig. 4. L. M. N. O. P. Q. is the Sweating-houſe, in Perſpective, ſhewing in part the Manner of the Floors and Pillars as they were placed.

Fig. 5. R. S. T. U. is the double Floor, whoſe upper ſurface lies even with the tops of the Flews in the perſpective Draught.

Fig. 6. W. X. is one of the Flews, or Tunnel-Bricks.

Remarks by Dr Harwood. ibid. p. 2228.

2. Certainly *Wroxeter* was one of the moſt conſiderable Military Stations or Colonies the *Romans* had in this Iſland; the City Wall, as appears from a Survey taken by Mr. *Lyſter*, was not much leſs than three Miles in Circumference; 'tis not improbable, but that it was founded by *Suetonius Paulinus*, or after by *Agricola*, in their March to ſubdue *Mona*, now *Angleſey*. I have been inform'd by Sir *Chriſt. Wren*, that he diſcover'd the remains of ſuch another *Hypocauſt*, when they were laying the Foundation of the King's Houſe at *Wincheſter*.

Of Wroxeter, *by Mr.* William Baxter. ib. p. 2230.

XVI. *Veroconium* Antonini, atq; Ptolemæi Ravenati Monacho prodigioſè, ut ferè omnia, *Utriconion* eſt *Cornoninorum*, pro *Vericonium Cornoviorum*, undè diſcimus *Veroconium*, ſeu *Vericonium*, fuiſſe *Cornaviarum*, ſive *Cornoviorum* caput. Saxonibus *Urecenceaſter*, nobiſque hodiè correptè *Wroxeter* eſt pro *Werocceſter*. Nomen dedit hæc Urbs vicino monti *Wreken* appellato, atque etiam vicino vico *Wrocwandin*, quod *Arcem* ſonat *Veroconienſem*. Nennio Britanno *Caer urnach* appellatur; verum correptè puto pro *Caer üar na üag*, ſive *Civitas* ad *Cervicem aquæ*. De *Urnaco* enim Gigante, de quo crepant Britannorum Fabellæ, piget quicquam referre. Neque ſanè *Veroconium* ipſum quicquam aliud ſonat, quàm *üaro conüi*, ſive *Cervix aquæ Principis*, vel *Sabrianæ*. Nam & *Cond* & *Kend* Britannis erat pro *Capite* & *Principe*. Idem igitur *Condüi*, ſive *Conüi* quod & *Savrian*, ſive *Amnis Regina*. Extat etiam antiqui operis inſignis Parietina, accolis vocati *Theoldwork*, ſive *Antiquum*

Plate VII. Part IV. P. 68.

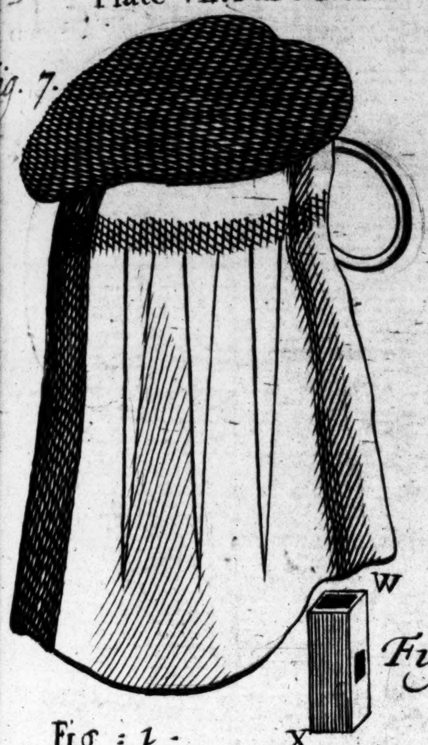

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Fig. 6.

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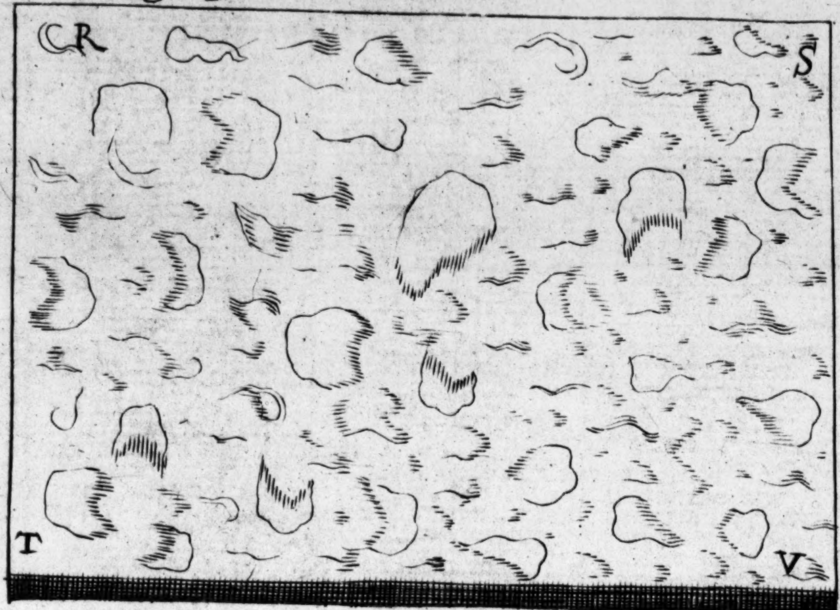

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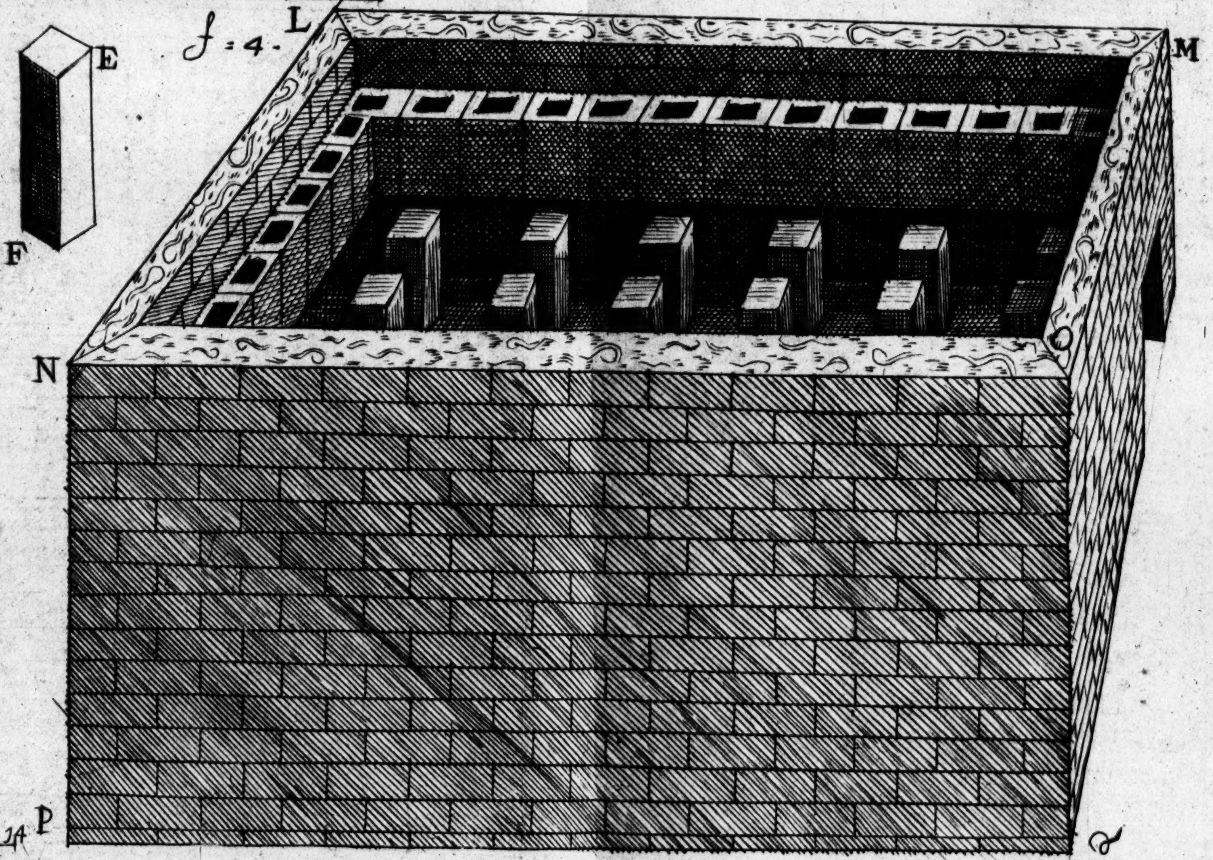

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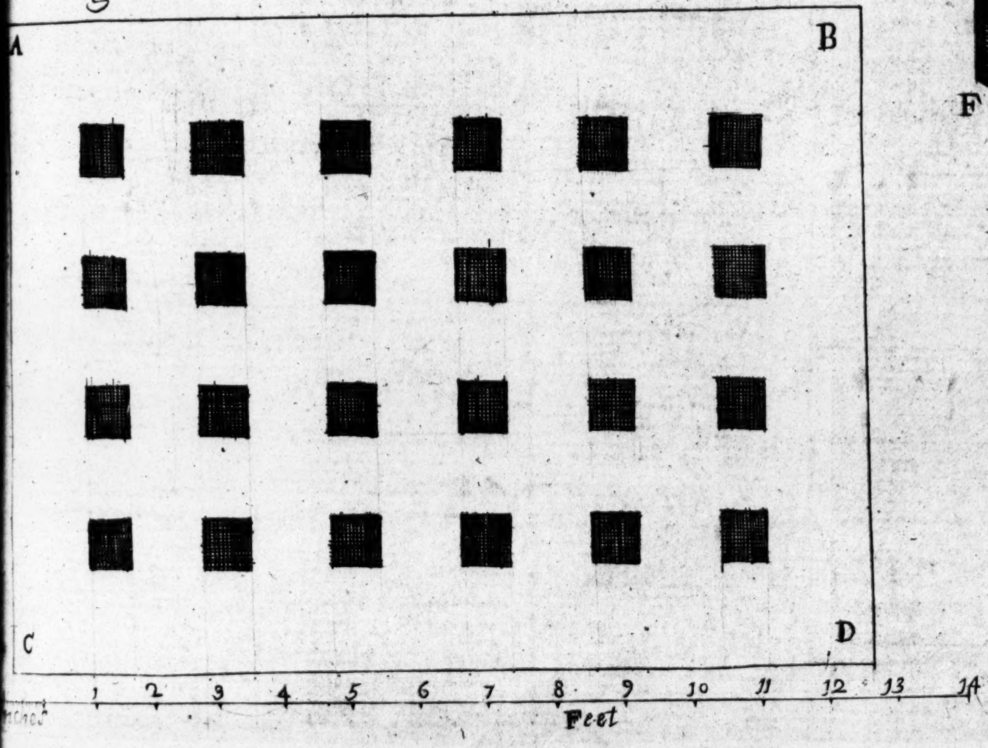
Fig : 1 -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opus, vel *ædificium:* quod equidem conjecerim ex Arcuum veſtigiis Romanum fuiſſe Balneum. Antiqua durat inter plebem fama, hanc Urbem fuiſſe, immiſſis de *Veroconio* monte Paſſeribus, à Danis incenſam; quod quid ſit alii forſan meliùs dicent. Certè vel ferreum ſigillum ibi erutum, cui Reguli cujuſdam Chriſtiani caput Romano Diademate cinctum, & promiſsà comâ, ſub hâc Inſcriptione *Caput ſervi Dei*, ſatis indicio eſt, eam non fuiſſe à Saxonibus deletam. Hujus Sigilli Ectypon aliquot retro annis perquam humaniter mecum communicavit modò Reverendus *Veroconienſis* Eccleſiæ Presbyter, *Thomas Markham.* Imò & crediderim vel ex Ravennatis Itinerario eam ad ejus tempora, hoc eſt penè ad Octavum Sæculum, adeòque aliquanto diutiùs, floruiſſe, & caput fuiſſe *Cornaviorum*, forſan etiam Regia Merciorum Sedes. De tantæ urbis ruderibus, melioribus, uti quidem ſperamus, auſpiciis caput ſuum extulit *Veroconium novum*, non ita longe à vetere poſitum, de Alneto Britannis, ut vulgo fertur, dictum *Pen Güern*; cum nobis ex Autoritate vetuſtiſſimi cujuſdam Bardi *Pen Güern Powys* ſit in *Venedotis* in Agro Montegomerico. Saxonibus appellatur *Scrobesbyrig*, quod eſt *Civitas in dumis*. Britannis etiam hodie eodem plane intellectu *Amwithic.* Siquidem *Wydh*, ſive *Gwydh*, vel, ut in Legibus Regis Howel ſcriptum legimus, *With* Britannis dicitur *Sylva*, additáque Præpoſitione *am*, quod illis, ut & Latinis *circum* eſt, *Amwyth* dicentur *humiliora fruticeta*, Saxonibus *Scrobes*, & vernaculâ Dialecto *Shrubs.* De *Amwith* etiam Adjectivum effingitur *Amwithic*, ſive *Dumoſa*. Normanni tandem, complanato agreſti ſono, de *Scrobesberie* fecêre *Slopesberie*, de quo Latinizantium *Salopia*, ut & *Salisberie* de *Sarisberie.* Hæc equidem eo libentiùs commemoro, quo antiquæ Patriæ meæ memoriam redderem illuſtriorem. Siquidem in hâc Urbe duobus retro ſæculis Majores mei Duumviratu, ſummo ejus loci honore, functi ſunt, poſterique eorum civitate gaudent perpetuâ; quod de Romano antiqui *Veroconii* jure tractum exiſtimo.

Of the Hypocauſta of the Ancients, by the ſame. ib. p. 2132.

XVII. The Ancients had two ſorts of *Hypocauſta*; the one called by *Cicero*, *Vaporarium*, and by others *Laconicum*, or *Sudatio*, which was a large Sweating Bath: In which were *Tria vaſaria ahena*, called *Caldarium*, *Tepidarium*, and *Frigidarium*, from the Water contained in them. The other ſort of *Hypocauſtum* is not ſo diſtinctly handled by Antiquaries, and it was a ſort of a *Fornax*, or Kill to heat their Winter Parlours, *Cœnatiunculæ Hybernæ. Erat & Diæta, ſive Cœnatiuncula* (ſaith *Argol* upon *Panvinius*) *ſub quâ ignis accendebatur: Unde & Cœnatio Hypocauſtum. Cœnationes Æſtivæ & Hybernæ* are mentioned by *Cicero in Epiſtolis.* The Terrace Floor is called by *Vitruvius*, *Teſtudo. Teſtudines Alveorum in Communi Hypocauſi calefacientur*, ſaith the ſame Author. This *Hypocauſis* was called *Alveus* and *Fornax:* And the Man that tended the Fire *Fornacator*. The *Tubuli* ſeems to have been contrived to convey away the ſmother, that otherwiſe would choke the *Fornacator:* This kind of Stove ſeems to be graphically deſcribed by *P. Statius* in *Balneo Hetruſci.* Of the Terrace *Argol* has theſe Words: *Teſtudines ſunt pavimenta ſub quibus Fornax ardet.* By the way, I take the word Stove to

be deriv'd from *Æſtus quaſi Æſtuvium*, there wants hitherto a proper *Etyingmon*.

Ancient Braſs Inſtruments in Yorkſhire, *by Mr.* Thoreſby n. 322. p. 393.

XVIII. 1. As the Servants of Mr. *Ellis* of *Kiddel*, were Plowing in a Place called *Oſmond-thick*, near the noted *Bramham-Moor*, they diſcovered five or ſix Braſs Inſtruments, which are of different ſizes, from little more than 3 to 4 Inches and an half in length, and from 1 and a half to 2 Inches and an half in breadth: They are ſomewhat in the form of a Wedge, as proceeding from a thin Edge, which after ſo many Ages is tolerably ſharp, to 1 and an half or 2 Inches at the thicker end, where they are wrought hollow to put upon a Shaft: Each of them has an Ear or Loop as in the Figure. Some ſuppoſe them to have been *Arrows-Heads* or *Axes* of the ancient *Britains*; others, thoſe of the *Roman Catapultæ*; but I think they are as much too heavy for the firſt, as they are too light for the laſt. I ſhould rather take them to have been the *Heads* of *Spears*, or *Walking-ſtaves* of the civilized *Britains*; and tho' of a ſomewhat different Form from thoſe deſcribed by * *Speed* in their Portraitures, taken I preſume from ancient Manuſcripts, yet by the Loop in the ſide we may better conceive how thoſe ornamental Labels were faſtened, than by the Pictures there exemplified. *Swords* or *Daggers* have been found in *Ireland* and *Great Britain* of late Years; one of which was brought me from the former: It proves of a middle ſize, *viz.* eighteen Inches long in the Blade; whereas of thoſe found in *Wales*, ſome were but twelve, others twenty four. The Hilt or Handle probably was of Wood, (as is that of an old Sword that I have now by me, which is five Foot and an half long) for that it is wholly conſumed: They have been faſtened together by four larger or two leſs Nails, as appears by the Holes in the Braſs which are yet entire. I have an ancient Spur, that is no leſs than ſix Inches and an half long from the Heel to the middle of the Rowel; but this, which is gilded, and of nicer Workmanſhip, I ſuppoſe to be of a much later date.

Plate 7. *Fig.* 7.

* Hiſt. Gr. Brit. ch. 6.

Remarks by Mr. Thomas Hearne *to Mr.* Thoreſby. ib. p. 395.

2. Theſe *Inſtruments* it appears from your *Letter* are of *Braſs*, and are *five* or *ſix* in *number*, but of different *Sizes*, from a little more than three to four *Inches*, and an half in *length*, and from one and an half to two and an half in *breadth*. They are ſomewhat in *form* of a *Wedge*, as proceeding from a *thin Edge* to one and an half or two *Inches* at the *thicker end*, where they are *hollowed* to put upon a *Shaft*. From your *exact* and *nice* Relation, 'tis plain that they are juſt like that we have in the *Repoſitory* adjoining to the *Bodleyan* Library at *Oxford*. This has been kept there for ſeveral *Years*; but where 'twas diſcover'd, there is not the leaſt *Memorial* to inform us. Perhaps it might be procur'd by Dr. *Plot*, when he was writing the *Natural Hiſtory* of *Staffordſhire*, where he has [a] mentioned ſeveral *Inſtruments* of the ſame kind dug up in that *County*. You have told me that 'tis your Opinion that theſe *Inſtruments* were the *Heads* of *Spears* or *walking Staves* of the *civilized Britains*; and for *Confirmation* of it you refer me to Mr. *Speed's* Hiſ-

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[a] *See* Chap. X. §. 19. &c.

tory of *Great Britain*, [b] where he has publiſh'd the *Figures* of the *ancient Britains* both before and after they were *civiliz'd*. You acknowledge however that the *Tops* of the *Spears* there are *ſomewhat different* from thoſe we are now conſidering. And indeed they are not only *ſomewhat* but *altogether different*, being exactly of the ſame *Make* with thoſe we find in the *Columna Trajana*, and the *Books* that repreſent to us the *Military Inſtruments* of the *old Romans*, *Greeks*, *&c.* But had they been of ſome *Reſemblance*, yet I cannot ſee that thoſe *Figures* in *Speed* are of any *Authority*: For tho' you gueſs that they were copied from *old MSS.* yet I could never yet meet with any *MSS.* of our *Britiſh Hiſtory* that have any ſuch *Figures*. If ever any one had them, we have reaſon to preſume that other *Books* upon the ſame *Subject* would have retain'd them; at leaſt we ought not to doubt it of *Copies* of the ſame *Author*. That is the *Method* obſerv'd in other ſorts of *MSS.* The *Illuminators* were generally left at liberty as to the *Ornamental* Parts of the *Great Letters*; but when any *Figures* were to be *depicted* that ſhould illuſtrate and explain the *Author*, there they were to be *exact* and *punctual*, and they had no more Allowance to *alter* them, than they had to *alter* and *interpolate* the *Text* of the *Author* himſelf. Hence I am inclin'd to think that theſe *Figures* are *modern*, and are *owing* to Mr. *Speed* himſelf. 'Tis alſo what himſelf inſinuates in the ſame *Chapter*, acknowledging that they were adapted to the *Deſcriptions* given of the *Britains* in *ancient Authentick Authors*. But not to examine other *Particulars*, the *Form* of the *Spears* in their Hands is not countenanc'd by any *Authority* of Note. For tho' *Herodian* has acquainted us that they uſed *ſhort Spears*, yet he is ſilent as to the *Make* of them. Nor indeed have we any where a good Account of the *Military Arms* of the *Britains*. The *Authors* tranſmitted to *Poſterity* by them are modern in compariſon of the *Roman Writers*, and are withal *Romantick* and not to be rely'd on. And as for the *Bards* they took no care to tranſmit to *Poſterity* theſe *Weapons*, or to give us *nice Relations* of their *Countrymen*. 'Tis true, there have been and are ſtill found ſeveral *Inſtruments* made of *Flint*, which the beſt *Judges* eſteem to be *Britiſh*. The *Flint Heads* of their *Arrows* are commonly called in *Scotland Elf-Arrows*, as being ſuppoſed to have an *extraordinary Virtue* againſt the *Elves*, and to drop from the *Clouds*. There are other *Flints* ſomewhat in *form* of *Axes*, and theſe Dr. *Plot* calls [c] *Britiſh Axes*; but Dr. *Leigh* thinks [d] they are *Indian*. Sir *William Dugdale* inclines to the Opinion embrac'd by Dr. *Plot*, and he acquaints [e] us with ſeveral of about four *Inches* and an half in *length*, curiouſly wrought by *Grinding*. But they might as well have been *Roman*, the *Romans* having uſed *Flint Weapons* as well as the *Britains*, and 'twas from the *Romans* that the *Britains* learn'd the *Art* of *working* them. That which alſo ſeems to make us believe that they might be *Roman*, is that thoſe mentioned by Sir *William* were found at *Oldbury*, *Aldbury* or *Ealdbury*, which was a *Roman Fort*, and is the ſame in Signification with *Alcheſter* in *Oxfordſhire*, *Alcheſter* being nothing elſe but Ealꝺ-ceaꞅꞇeꞃ, ſo call'd by the *Saxons* to ſhew that 'twas a *Place* of *Antiquity* even in their *Time*. And tho' the *Anonymous Author* of the *Antiquities* of *Alcheſter* at the end of the *Parochial Antiquities* of *Ambroſden* derives it from *Allectus*, as if he were the *Founder*, yet there is no *Authority* either from *Coins*, *Inſcriptions*, or *Books* to countenance the *Conjecture*.

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[b] Lib. I. c. 7. [c] Loco ſupra citat. [d] *Natural Hiſtory of* Lancaſhire, lib. I. p. 181.
[e] *Antiquities of* Warwickſhire, pag. 778.

Now ſince there are no *Authentick Authors* by which we may learn what *Arms* were made uſe of by the *Britains* in their *Wars*, I can think of no properer *Method* for finding this out than by ſeeing what *Arms* were in uſe amongſt thoſe *People* from whom they *immediately* had their *Original*. Mr. *Sheringham* inclines to the *Story* of *Geoffry* of *Monmouth*, who deduces the *Britains* from the *Trojans*. And this is the Opinion too of ſeveral other *learned Men*. But whatever their *Abilities* and *Authority* might be in other Reſpects, yet in this they muſt be reckon'd *partial*, and I rather ſtrike in with thoſe other *Writers* of *more Authority*, who derive the *Britains* from the *Gauls*; amongſt whom Mr. *Camden* is *chief*. He has *diligently* and *nicely* prov'd that the *Gauls* and *Britains* had the ſame *Religion*; that they *both* had their *Bards* and *Druids*, enjoy'd the ſame *form* of *Government*, us'd the ſame *Method* of *Fighting*, had the ſame *Natural Genius*, were equally *candid* and *innocent*, were addicted to *change* when provok'd, were *compaſſionate* to their *Relations*, and always ready to partake in their *Vindication*. He has withal ſhewed that they *both* affected *great Numbers* of *Servants*, that their *Buildings* were alike, and were ſurrounded with *Woods*, that they *both* uſually wore *Chains* of *Gold* about their *Necks*, and had *Rings* on their *Middle-Fingers*; that they *both* wore *long Hair*, and that the *Garments* call'd *Brachæ* were *common* to *each*. Theſe Things he confirms from the *beſt* and *moſt approved Authors*. And, as the *chiefeſt Argument*, he has alledg'd Variety of *Inſtances* to ſhew that they ſpoke the ſame *Language*. Mr. *Sheringham* himſelf was aware of this, and therefore to evade the *Force* of the *Argument* he makes [f] the *Trojans* to come through *Gaul*, which being then thinly inhabited, he ſays *Brute* and his *Companions* ſoon conquer'd it, built a *City*, and continued there 'till ſuch time as they had well peopled it, after which they paſs'd over into *Britain*, and by that means the *Britains* came to have the ſame *Language*. This is his *Hypotheſis*, which is ſo far from deſerving *Approbation*, that it does not ſeem conſiſtent with uſual *Prudence*, nor with the other *wiſe Acts* that are aſcrib'd to *Brute*: For no one that *rightly* conſiders can think that *Brute* would voluntarily leave ſo *large* a *Country* as *Gaul* for one that was ſo much *leſs*. It is therefore more likely that the *Britains* had their *immediate Original* from the *Gauls*. *Cæſar* himſelf thought ſo as to thoſe that inhabited more near the *Coaſts*, notwithſtanding his *Obſervation* that the *Midland People* were *Aborigines*. Nor will *Boxhorn*'s *Aſſertion*, that the *Gallick Tongue* was the ſame with the *Scythian*, overthrow this *Hypotheſis*: For it may very well be ſuppoſed that the *Gauls* came firſt from the *Scythians*

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[f] *See his Book* de Origine Gentis Anglor. pag. 7. & ſeqq.

ans, who are in *Juſtin* [g] obſerv'd to have been the moſt *ancient People*, and to have contended with the *Ægyptians* on that *Score*. This will *exactly* agree with what *Cambden* and others have aſſerted concerning the *Gauls* being deſcended from *Gomer*, the *eldeſt Son* of *Japhet*. I know indeed that Mr. *Sammes* derives the *Scythians* from *Magog* the *ſecond Son* of *Japhet*. But (not here to take notice of his contradicting himſelf in this *Point)* ſince *Strabo* [h] and *Stephanus* [i] mention a *City* call'd *Gogarena* between *Colchis* and *Iberia*, and ſince the city *Hierapolis* in *Cœlo-Syria*, according to *Pliny* [k], was call'd by the *Syrians* MAGOG, 'tis more probable that *Magog* ſeated himſelf in thoſe *Countries*, near to which 'tis agreed his *Brethren* ſettled; than that he wandred ſo far out of the *Way* from them. Here I cannot but take notice that the *Britains* were like the *Scythians* a *frugal People*, and their *long Lives* (they often living to the *Age* of 120 *Years)* might in great meaſure be aſcrib'd to their *Temperance*, and their *Milk Diet*, juſt like the *Hippomolgs* mentioned by *Homer* [l]. And as *Æſchylus* tells us that the *Scythians* were ἱππικῆς βοτῆρες εὔνομοι, *a juſt Nation and addicted to the Feeding of Horſes*, ſo the ſame may be ſaid of our *ancient Britains*, who were very *religious* and obſerv'd the *Rules* of their *Prieſts*, and took extraordinary delight in *Cattle*, whence perhaps they might affect to have the *figures* of *Beaſts* cut upon their *Bodies*. From what has been laid down I hope 'tis plain that the *Gauls* and *Britains* were of the ſame *Original*. What we have next to do is to ſee what *Arms* were us'd by the *Gauls*. There are ſeveral *Authors* that have written of the Nature of them, and particularly *Cluver* and *Boxhorn*. Their *Names* are *Spatha*, *geſſum*, *(geſum* or *gæſum) lancea*, *ſparum*, *cateia*, *mataris* or rather *materis* (not *matara) machæra*, μέϱεις, μαῦϱεις, μάϱεις or μάαϱεις [m] *thyreos*, and *cetrum* or *cetra*. I ſhall not here inſiſt upon the Signification or Reaſon of the *Names*, but only obſerve in general, that the *geſſum* was a *Javelin*, the *ſparum*, *cateia* and *mataris* were different ſorts of *Darts*, and that the *thyreos* was an *oblong* and the *cetrum* a *ſhort* ſort of *Shield*. So that the *Spatha* only remains (for the nature of the *Lance* is well known) to be compar'd with the *Weapons* we are conſidering. 'Tis call'd by the *Italians* SPADA, and by the *Spaniards* ESPADA. From the *Deſcription* that *Iſidore* has left us of it, we are inform'd that 'twas a *two-edg'd Sword*, with which they *cut* and did not *thruſt*. Whence 'tis plain theſe *Arms* had not *ſharp Tops*, agreeable to what *Livy* [n] has related that their *gladij* were *prælongi, ac ſine mucronibus*. And *Polybius* has the ſame reaſon why they did not *puſh* with them. Hence it is clear that our *Inſtruments* which have not *two Edges*, but are *dull* like *Wedges* were not *ſpathæ*; and ſince they do not agree to any of the other *Gallick Inſtruments*, we muſt carry on our *Inquiry*, and examine whether they agree with any of the *Arms* of ſome other *ancient Nation* that made a *Figure* in *Britain*.

Our *Anceſtors* the *Saxons* will have no ſhare in this *Inquiry:* For 'tis plain from the *Hiſtory* of them given by *Verſtegan*, and the *figures* publiſh'd by him, that *Spears*, *Halberds*, *Shields*, *Croſs-bows*, *Swords*, (which were *broad* and *bowing*, ſomewhat in faſhion of a *Scythe*,) and *Hatchets*, which they call'd *Bills*, were the *Arms* made uſe of by them; nor did the *Weapons* of the *Danes* that ſucceeded them much vary if at all: Coming from the *ſame Parts* they us'd the *ſame Cuſtoms* in their *Military Undertakings*. For tho' the *Normans* endeavour'd to make an *intire Alteration*, yet they found the *Attempt* impracticable, and they were forc'd to acquieſce, and lay aſide their *Propoſals*, which thwarted ſo very much thoſe *ancient Cuſtoms* that were here *generally* entertain'd and receiv'd. But however, notwithſtanding theſe *Inſtruments* do not reſemble either the *Saxon* or *Daniſh Military Arms*, yet I find in *Wormius*'s *Muſeum* ° two *Cimbric Inſtruments* with which they have ſome *likeneſs*. Theſe he tells us were of *Braſs*, and he calls them *Wedges*: The larger of them was five *Inches* in *length*, and three in *breadth*. He is of opinion that they were us'd in the *Wars*, eſpecially when the *Armies* were *very near* each other. If they had *Holes* by which they might have been fix'd to *Helves* he would have believ'd them to be *Battle-Axes*; but being neither *hollow* (as ours are) nor having any other way of being faſten'd to other *Inſtruments*, he concluded that the Name of *Wedges* might be moſt proper. *A very ingenious Gentleman* ſome time ſince inform'd me that much ſuch *Inſtruments* had been found in the *Iſle of Man*; and that a great many *Urns* had been alſo diſcover'd there, as likewiſe divers *Inſcriptions* with *ſtrange Characters*. I do not queſtion but the *Inſcriptions* are *Runick*. And 'tis highly probable that the *Inſtruments* were like thoſe in *Wormius*; but if they agree *exactly* with ours they will from what I ſhall ſay by and by appear to be *Roman*. For notwithſtanding it be commonly held that the *Romans* never were in this *Iſle*, yet I ſee no other reaſon why it ſhould be thought ſo, than that the *ancient Authors* now remaining do not mention it. This is only a *negative Argument*, and what we ought not to lay a very great *Streſs* upon. The *Urns* ſeem clearly to evince that they were here. I know indeed that 'tis ſaid that theſe *Urns* muſt be perfectly *Daniſh*, by reaſon of the *ſmall black Bones* and *Aſhes* found in them; which however is no *ſure Ground* to go upon. For I have ſeen in the *Bodleian Repoſitory* a Piece of a *Roman Urn*, which was dug up ſeveral *Years* ago at an *old Roman Town* in *England* with many others, ſome of which were of *different Figures*. 'Tis now in a *Box*, and with it are *little black Bones*, *Aſhes*, &c. wrapped up in two *Pieces* of *coarſe Linen*. This *Linen* is in the ſame *figure* with the *Urn*, but the *Urn* for one of the *Pieces* is wanting. The *Smallneſs* of the *Bones* ſhews that they are the *Relicks* of *Children*. It was cuſtomary among the *Romans* after the *Bodies* were burnt to waſh the *Bones* with *Wine* and *Milk*, and afterwards the *Women* wrapt their *Children* in *Linen*, dry'd them in their *Boſoms*, and then put them into *Urns* to be buried. This *Cuſtom* was alſo peculiar to the *Danes*, who learn'd it from the *Romans*, from whom likewiſe they receiv'd *Urn Burial* it ſelf. Such *Urns* too are mentioned by the famous Sir *Thomas Brown* to have been found at *Old Walſingham* in *Yorkſhire*. Nor is the *Roman Hiſtory* altogether ſilent of the *Iſle of Man*'s being known to the *Romans*. For *Plutarch* expreſly tells us,

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[g] Hiſt. Lib. II. c. 1.
[h] Lib. II.
[i] De Urbib. voc. Γωγαϱήνη.
[k] Nat. Hiſt. Lib. V. c. 23.
[l] Il. XIII. ℣. 3.
[m] *See* Livy Lib. VIII. c. 24. Edit. Oxon.
[n] Lib. XXII. c. 46. Edit. Oxon.

that

° Pag. 354.

that one *Demetrius* ſailed hither, as well as to other *Britiſh Iſles* in the Reign of *Adrian*. 'Tis no wonder that *Runick Inſcriptions* are diſcovered in the *Places* where *Roman Urns* are found. Thoſe *Inſcriptions* might have been made upon other *occaſions* after it became in *future Ages* inhabited by *Danes* and *Norwegians*. The ſame *Accident* has ſometimes happen'd in *England*. And Mr. *Camden* particularly relates in the Cloſe of his *Diſcourſe* concerning *Stone-Henge*, that in the Time of King *Hen.* VIIIth. was found at *Stone-Henge* a *Table* of *mixt Metal* on which were engrav'd many *Letters*, but the *Characters* were ſo *ſtrange* that neither Sir *Thomas Elyot*, nor Mr. *Lilly*, the famous *School-Maſter* of St. *Paul*'s, could tell what to make of them, and ſo there was no care taken to preſerve the *Monument*, the *Loſs* of which was afterwards much lamented by *Olaus Wormius*, who thought it to be *Runick*, as without queſtion it was: and yet *Stone-Henge* itſelf is a *Roman Work*, as has been made out by Mr. *Inigo Jones*, who tho' he was confuted by the late *learned* Dr. *Charleton*, yet Mr. *Jones*'s Opinion was very well defended by Mr. *John Webb*, who has in his *Book* diſtinctly examined the *Methods* made uſe of both by the *Romans* and the *Danes* in their *Buildings*.

Having proceeded thus far in this *Inquiry*, and ſhew'd that theſe *Inſtruments* were not *military Arms* either of the *Britains*, or of the *Saxons*, or of the *Danes*: I ſhall now carry it on farther and endeavour to prove that they are owing to the *Romans*, which is what I have before inſinuated. I once thought that they were a ſort of *Axes* which the *Romans* made uſe of in their *Sacrifices*, of which Dr. *Plot* takes notice of two ſorts, the *ſecures Lapideæ* and the *ſecures Cupreæ*, tho' Dr. *Leigh* will have his *Inſtances* to be both *Indian*. Upon a more narrow *conſideration* of the *Roman* ſacrificing *Inſtruments*, I have quite chang'd this *Opinion*, not finding the leaſt *Foot ſteps* of ſuch *Axes* in any of the *Books* of *Roman Antiquities* I have hitherto conſulted. On the contrary, they are in the *Suovetaurilia* or *Solitaurilia* of the *Columna Trajana* repreſented in the ſame *Form*, and faſtened in the ſame *manner*, that we uſe at *this Day*. And ſo alſo in other *Sacrifices*, as may partly be ſeen in the *Gemms*, *Rings*, *&c.* publiſh'd out of the *Studies* of *Auguſtinus*, and *Gorlæus*, as well as in the *Monuments* of *Gruter*, *Reineſius*, *Spon* and *Fabretti*, to omit the *Authors* collected upon this *Subject* by *Grævius* in his *large Body* of *Roman Antiquities*. Neither could they have been the *Heads* of *Spears*, as is manifeſt from the ſame *Authorities*. The *Roman Spears* and *Javelins* occur very frequently, and yet not one of them either on their *Coyns* or *elſewhere* is be met with in the *Figure* of theſe *Inſtruments*. 'Tis true ſome of their *Spears* had two *Heads*, ſo they might uſe either *End* uppermoſt as they pleas'd. We have one of theſe in *Auguſtinus*[q]. The *Heads* differ from one another, but they neither of them anſwer our *Monuments*. Nor are the moſt antient *Spears* of the *Romans* we meet with different from thoſe they made uſe of in more *modern* Times, as may in ſome meaſure be ſeen in the *famous Shield* lately publiſhed at *Oxford*[r], which is certainly *au-*

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[q] Gemm. & Sculpt. antiq. *ex Edit.* Jac. Gronovii Franeq. 1694. *Part. num.* 155.

[r] *Vide* Livij *Edit.* Oxon. *Vol.* VI. *p.* 195.

thentick. It's *Antiquity* is defended in the *Place* I have cited. It may here be farther added to what is there alledg'd that *Lucius Florus* gives [s] us the firſt *Inſtance* of the *Romans* fighting upon *Horſes* without *Bridles*; and in the *Columna Trajana* [t] the *Horſes* are placed in *full ſpeed* with their *Riders* without any *Bridles* or other *Curbs* to reſtrain and guide them, a great many of the *Romans* having made themſelves *Maſters* of this method of *Fighting* that they might like the *Numidians* (who were *famous* for it) be the leſs incumber'd in the *Battle*, and ruſh upon the *Enemy* with the more *Force*. Their *Deſultores* alſo are *Proof* enough of it's being *practicable*.

But now tho' theſe *Inſtruments* are not properly *Roman military Weapons*, ſuch as they us'd in their *Battles*, yet they were of ſervice amongſt the *Soldiers*; and good Numbers of them were *conſtantly* provided to be carried about in the *Army*. For I believe that they are *Roman Chiſſels*, and that they are us'd to cut the *Stones*, and other *Materials* that were judg'd ſerviceable for builing their *Camps*. This is not *Conjecture* only as appears from the *Columna Trajana*, where [u] the *Soldiers* are repreſented poliſhing the *Stones* for the *Roman Tents* in the *Dacic* Wars with ſuch ſort of *Chiſſells* made of *Braſs*. Theſe *Chiſſells* they beat and worked into the *Stone* and other *Materials* with *Mallets* of the ſame *Metal*. We have other *Inſtances* of it in the ſame *Pillar*, which is one of the beſt *Monuments* we have by which to judge of the ſeveral *Inſtruments* made uſe of by them in their *military Enterpriſes*. Theſe *Chiſſells* were of *admirable ſervice* in making their *Aggeres*, which conſiſted of *Earth*, *Stones* and *Timber*. The *Stones* were ſometimes thrown together without any *poliſhing*; but that was more rarely, and 'twas look'd upon as a better *ſecurity* to have them work'd that they might lye even. By this Account the reaſon will be eaſily perceiv'd why theſe *Inſtruments* are *hollow*, namely to faſten *Handles* to them for more convenience in driving them. If they had been *Wedges*, 'twould have been a great *Inconvenience* to have had them *hollow*. Beſides the *Wedges* by being drove into the *Wood* or *Stones* would have been *ſtrangely* worn on the *Sides*, and have receiv'd conſiderable *Alterations*; whereas the *Sides* of ours in the *Bodleian Repoſitory* (and I ſuppoſe your's are ſo too) are juſt as they were at firſt, and there is not the leaſt *Change*, unleſs it be on the *Edge*, which is very *blunt* and much *broken*, which I gueſs to have proceeded from the *Stone*. As for the *Ears* or *Loops*, 'tis probable they might be put on that thereby the *Handles* might be fixt the better; or perhaps they were deſign'd for the Eaſe of the *Souldiers*, who in their *Journeys* might by this means faſten them to their *Girdles*. For I believe moſt if not all the *Soldiers* had ſuch *Inſtruments*, which they were oblig'd to make uſe of when *Neceſſity* requir'd. I know that 'tis the opinion of moſt that there were a few particular *Perſons* always in the *Army* to whom theſe *Works* were committed, and that they were *exempt* from the Office of *Soldiers*, and that they were *marmorarii*, *quadratarii*, *lignarii* and *ſtructores*. Theſe may be call'd all by one Name

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[s] *Lib.* I. *c.* 9. [t] *Num.* 199. [u] *In Num.* 167.

fabri murarii, tho' that is commonly reckon'd only another *Name* for *ſtructores*. But this is a wrong *Perſuaſion*, and *Fabretti* has [w] well obſerv'd that there are no *fabri murarii*, as they are taken for *Artiſts* diſtinct from *Souldiers*, on *Trajan's Pillar*. This *Obſervation* he has made in oppoſition to *Santi Bartoli*, who calls them expreſly *fabri murarij*. *Fabretti's Remark* as 'tis very juſt with reſpect to this ſort of *Artiſts*, ſo it muſt be noted that there were no other diſtinct *Artiſts* that were freed from the *Duties* of *Soldiers*. Even the *Artiſts* that had receiv'd *liberal Education* are to be comprehended in this *Obſervation*, I mean their *Phyſicians*: which is the reaſon that in *Fabretti* we have [x] the *Picture* of a *Phyſician* fortified with a *lorica* or *Coat of Mail* and moving his *Hands* to a *ſick Perſon* that was his *Patient*. The *lorica* ſhews he was one of the *better ſort* of *Soldiers* call'd *evocati*, thoſe of the *inferiour Order* being allow'd only a *Pectoral* of *thin Braſs*. It withal points out to us that he was, after he had finiſh'd theſe *Offices* to the *Sick*, bound to betake himſelf to *other Offices* of a *Soldier*. This was ſometimes intermitted, but in *Trajan*'s ſtrict *Diſcipline* 'twas *always* obſerv'd, he being reſolv'd to imitate and bring into *faſhion* the *Severity* that had been made uſe of in the more *antient Times*. For this reaſon we ſee the *Soldiers* in this *Pillar* duly exerciſing and performing, when there was any *need*, all the *Offices* of *Tradeſmen*, it being at this time *cuſtomary* to liſt *Tradeſmen* amongſt the *Soldiers* for this *Intent*.

Beſides the Uſes theſe *Inſtruments* were put to in forming the *Roman Camps*, they were moreover employ'd in making and repairing the *High Ways*, which ſwallow'd up a *large Quantity* of *Stone*, eſpecially in ſuch *Places* as were *marſhy* and *fenny*. The *Pomptin Marſhes* were vaſtly large, and yet at ſuch time as the *Soldiers* were too many to be us'd againſt the *Enemy*, a *motion* was made that they ſhould be employ'd to *drain* them, which was ſo well approv'd, that the *Senate* immediately gave Orders for it, and the *Soil* was ſo *rich* and *fertile* that *great Numbers* came and ſettled here, inſomuch that there were no leſs than XXXIII. *Towns* built upon the *Ground*. The *Waters* however afterwards got ſtrength again, and 'twas in a manner *wholly* drown'd; which made *Julius Cæſar* entertain ſome Thoughts of draining them *afreſh* and of carrying the *Appian Way* through them, whereas it had before went about them; but he fail'd in his *Deſign*, and 'twas left for one of his *Glorious Succeſſors* the Emperor *Trajan*, who after he had cleans'd the *Fens*, caus'd a *Stone Way* to be made through them, whereon were built *large Inns* and *magnificent Bridges* for Conveyance of the *Water* which was in the upper part of the *Marſh*. For memory of which he had a *Monumental Stone* erected with a proper *Inſcription*, by which it appears that the *Way* was XIX *Miles* in *length*, there being plac'd at the End of every *Mile* a *Mile-Stone*, and from thence the *Way* it ſelf was in ſucceeding Times call'd *Decennovium*. I might from hence take occaſion to mention other *Works* of the *Romans* in *Italy* of this kind, in which *Chiſſells* were *abſolutely neceſſary* for cutting the *Stones*; but this is needleſs at preſent, and therefore I ſhall only remark that as *Trajan* was diligent about the *Ways* in *Italy* and other *Parts*, ſo it ſeems he was no leſs careful of theſe *Affairs* in *Britain*. For notwithſtanding ſome tell us that the four *Great Ways* in *Britain* are owing to *Molmutius* one of the *Britiſh Kings* and *Belinus* his Son, yet Mr. *Camden* and others have ſhew'd that they are rather to be attributed to the *Romans*, being repair'd and made as it were quite anew (whereas before they were very *mean)* by *Trajan*, after he had reduc'd the *Britains* to *Obedience*. Beſides which *Ways* he alſo made divers other *Leſſer* ones here, and perhaps theſe *Chiſſells* that have occaſioned this *Letter* may be ſome of thoſe us'd by the *Souldiers* in his *Reign*; tho' before his Time *Acts* of this kind had been perform'd by the *Roman Souldiers*, who alſo forc'd the *Britains* to undergo the ſame *Drudgery*, which occaſion'd them to complain to *Agricola*, as if they were too *ſeverely* and *hardly* dealt with.

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[w] Syntagm. *de* columna Trajana. *pag.* 208. [x] Loco cit. *pag.* 217.

If it be ask'd how it comes to paſs that theſe *Inſtruments* are of *Braſs* rather than of any other *Metal?* it may be reply'd that they as well as the *People* of other *Nations* in former times thought there was an *extraordinary virtue* in *Braſs*. Whence it was that they us'd *braſs Inſtruments* when the *Moon* was in an *Eclipſe*[y], thinking that by beating of them ſhe would be the more eaſily recover'd from her *Labour*, which *cuſtom* almoſt *univerſally* prevail'd. And 'twas upon account of this *peculiar Virtue* ſuppos'd to be in *Braſs*, that the *Inſtruments* made uſe of in the *ſacred Offices* were in the more *early times* all of *Braſs*, that the *Tuſcans* uſed *Braſs Plowſhares* when their *Cities* were built, and that the *Prieſts* of the *Sabins* were ſhav'd with *Braſs Razors*[z]. *Heſiod* himſelf tells[a] us that the *Antients* us'd *Braſs Inſtruments* before *Iron* ones:

> Χαλκῷ δ' ἐργάζοντο· μέλας δ' οὐκ ἔσκε σίδηρος.

At which time not only their *Arms* but their *Houſes* were likewiſe of *Braſs*.

> Τοῖς δ' ἦν χάλκεα μὲν τεύχεα χάλκεοι δέτε οἶκοι[b].

The *Cuſtom* might prevail as well in *Britain* as *elſewhere*, *Iron* being not ſo very *plentiful* in the *firſt time* of the *Romans*, however it might increaſe afterwards when the *Bath-Forge* was erected, and all *proper Methods* us'd upon that occaſion. Nor ought it to be wonder'd how the *Braſs-Chiſſells* could be apply'd to the *Stone* without *breaking* to *pieces* immediately, any more than that the *Plough-ſhares* did not ſuffer the ſame *Damage* in caſting up the *Ground* and *grating* againſt the *Stones* with more Violence. The *Braſs* in thoſe early times was of a different nature from ours, and ſo temper'd as to endure much longer with leſs *inconvenience* in the ſeveral *Operations* to which it was employ'd.

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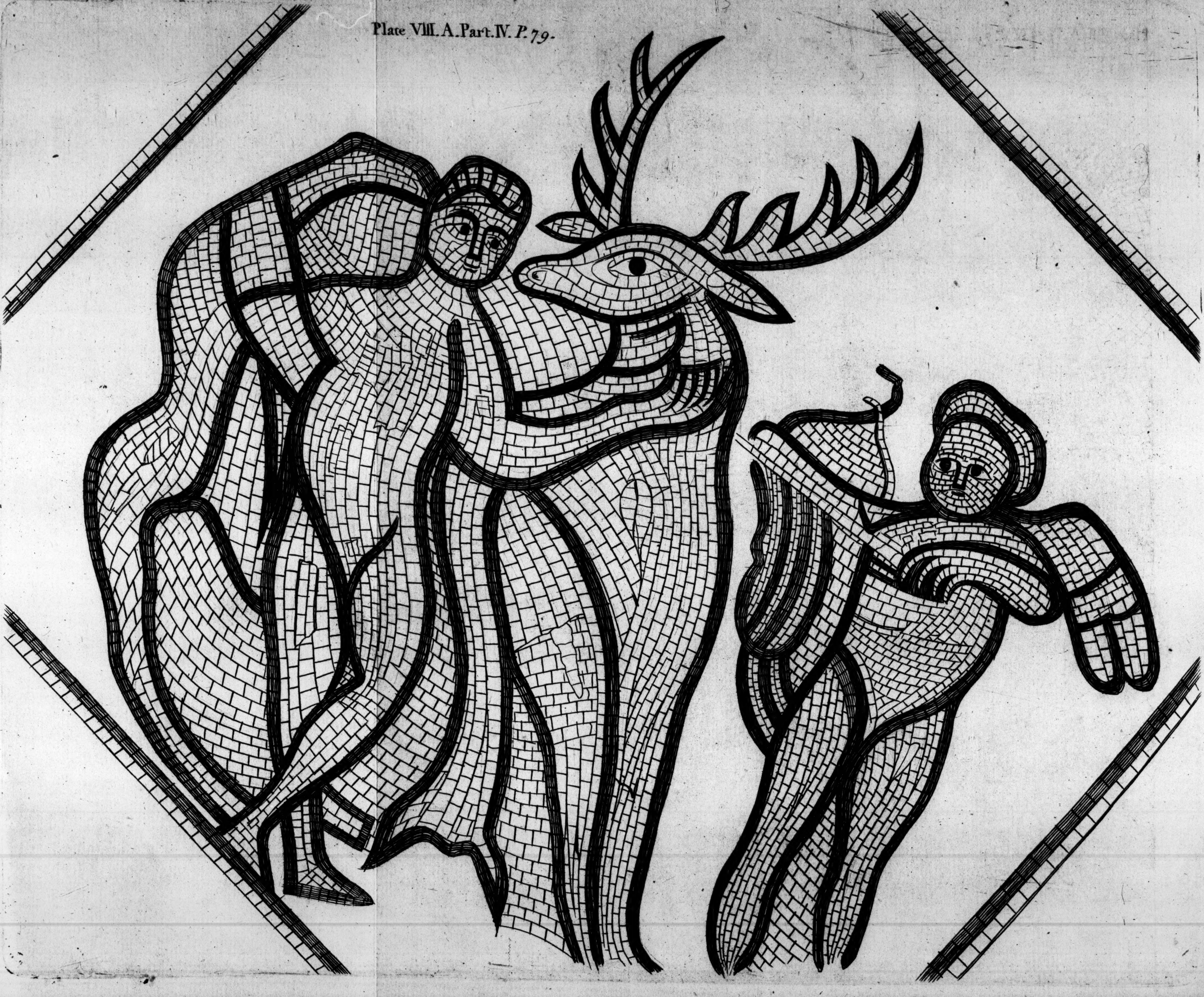
[y] *See* Livy *lib*. XXVI. *c*. 5. *Edit*. Oxon.
[z] *Vide* Rhodigini antiq. Lect. *l*. XIX. *c*. 10.
[a] Εργ. ϗ Ημ *lib*. I. ℣. 150.
[b] *Ibid*. ℣. 149.

Plate VIII. A. Part. IV. P. 79.



As for another Piece of *Antiquity* which you tell me you have in your *Collection*, namely a *Spur* that is no leſs than ſix *Inches* and an half long from the *Heel* to the *Middle* of the *Rowell*, which you take to be of a much later Date than the other *Monuments*, we have one in the *Bodleian Repoſitory* of much the ſame *length*, of which I have made mention in my *Additions* to Sir *John Spelman*'s Life of King *Ælfred*. There have been ſeveral others found in *England*, and you have juſtly gueſs'd your's to be more *modern* than the other *Inſtruments*. For theſe *Spurs* are certainly *Daniſh*, as appears from *Wormius*'s *Monumenta Danica* [c], where he has given us the *Figure* of one, and there is an Account of divers others towards the latter [d] End of his *Muſeum*, one of which is a foot and ſome odd *Inches* in *length*.

An Ancient Moſaick *Work, by Mr.* Carte. *n.* 331. *p.* 324. *See the Figure.* Plate 8. A.

XIX. It was firſt diſcovered about 40 Years ago, upon digging of a Cellar near *All-Saints* Church in *Leiceſter*, at about a Yard and half under the common preſent Surface of the Earth. What extent the whole Pavement was of is not known; but this Figure, which, by order of the Maſter of the Houſe, was preſerved, is an *Octogon*, ſurrounded by a Liſt, as you ſee in part repreſented in the corners of the Picture herewith ſent you. Without this, tho' not here repreſented, is a Twiſt or Wreath of various Colours; and round that, is a ſecond Liſt like the former. Theſe two Liſts, with the Wreath between them, are 6 Inches and a $\frac{1}{4}$ broad. The downright and tranſverſe Diameters of the *Area* are juſt a Yard; but the others, leading from corner to corner, are a Yard and two Inches and an half. The Man, from Head to Foot, is two Foot and $4\frac{1}{2}$ Inches. *Cupid* ſeems to be two Foot, but his Feet as well as the bottom of the Monſter are ſpoil'd, the *Teſſellæ* repreſenting them being gone. You will eaſily underſtand, that the whole *Area* of the Figure, which is here left blank, ought to be fill'd up with white *Teſſellæ*, in like manner as you ſee ſome Intervals of Figures here.

A teſſellated Pavement, and other Antiquities in Suſſex, *with Remarks by Dr.* Tabor. *n.* 351. *p.* 549.

XX. In *March* 1717 was dug the Meadow in which the greateſt part of the Pavement lies, it is near a Mile and half South-Eaſt of *Bourne*; contains about four Acres, and is of a triangular Form; the Southern Side is againſt the Sea; only a few Fiſhers Cottages, and a ſmall publick Houſe or two being between that and the Sea. On the Northern Side of the Meadow is a High-Way, which leads from *Bourne* to *Pevenſey*: the Weſt-Side is by a Fence of Poſts and Rails ſeparated from a large Corn Field, in Common belonging to the Pariſh. About the middle of this Fence is a Pavement, diſtant from High-Water-Mark a Furlong; in former times it might have been ſomewhat more, becauſe from this Point to the Weſtward, the Sea is always gaining from the Land. In the Summer 1712, when the Fence was repair'd; the Workman ſinking a Hole to fix a Poſt in, was hinder'd by ſomething ſolid like a Rock; but caſting out the Earth clean, found the Obſtacle to be Artificial. Whereupon, one *Purceglove* an ingenious Ingineer was ſent for, who with his Inſtruments bored through the Pavement;

[c] *Pag.* 43.

[d] *Pag.* 50.

ment; and in many places of the Ground about it, which he found to be full of Foundations: but this his Diſcovery of thoſe Foundations, was only a Confirmation of what the Inhabitants there have always obſerv'd, as well in Ploughing, as in the Growth of their Corn and Graſs: for in the common Corn Field, Weſt to the Meadow, to the diſtance of near half a Mile, they often raiſe bits of Foundations with their Ploughs; and in dry Summers, by the different Growth of the Corn, they can plainly perceive all that Tract of Ground to be full of Foundations.

The Pavement was little more than a Foot below the common Surface of the Ground; what lay next it was a ſmall Sea Gravel; the Poſition of it is very near due Eaſt and Weſt (about two Foot of the Weſt end of it reaching into the Corn Field;) its length is ſeventeen Foot and four Inches; its breadth eleven Foot. At firſt it ſeem'd to have been bounded with a thin Brick ſet on Edge, about an Inch above the *Teſſeræ*, ſo exactly ſtrait and even, as if Shot with a Plane; and ſo well Cemented, as if one entire Brick. But when the outſide of the Pavement was broke up, we found, that inſtead of Bricks ſet on Edge, as was imagin'd, it was bounded with a Border of Bricks laid flat, and their ends next the *Teſſeræ* turn'd up. The Thickneſs of theſe Bricks was an Inch and a Quarter; the Breadth not under Eleven, and not more than twelve Inches; the length full fifteen Inches; which, before they were turn'd up at their Ends, could not have been leſs than Seventeen. They were very firm, and not in the leaſt Warp'd or Caſt in Burning: when broke, their Subſtance was fine and well mixt, of as uniform and clean a Red Colour, as a piece of fine *Bole*; except at the ends where turn'd up, they were all over cover'd with a Plaiſter (the ſame which *Vitruvius* calls the *Nucleus*, of which more afterwards,) half an Inch thick; ſo hard, entire, and even, that it ſeem'd as one Stone, quite round the Pavement. Next within the Bricks, were a Liſt or Border of white *Teſſeræ*, thirteen Inches broad; within that, a Liſt of brown *Teſſeræ* (ſomewhat darker than a Whet-Stone, and ſomewhat lighter colour'd than the Touch-Stone) four Inches broad; then a Liſt of the White, five Inches broad; next within that, another Liſt of the Brown, four Inches broad: all the reſt of the Pavement was ſet with white *Teſſeræ*, without any Ornament or Figure; which though not Gay, look'd very Neat and Clean.

When this was firſt view'd, none of the Curious doubted, but that the Work was Roman; many were of opinion, that it might have been the Floor of a Temple, or a place of Worſhip. *Pliny* indeed [a] informs us, that theſe ſort of Pavements or *Lithoſtrota*, began to be in uſe in *Italy*, in the time of *Sylla*; who caus'd one of them to be made in the Temple of *Fortune* at *Præneſte*; perhaps the ſame which not long ſince was taken notice of by Mr. *Addiſon* [b]. I was rather inclin'd to ſuppoſe, it had been that Apartment belonging to the chief Officer where Juſtice was adminiſter'd; and the more, becauſe *Pilat's* final Sentence on our Saviour was pronounced from a Throne

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[a] Plin. Sec. Hiſt. Nat. Lib. XXXVI. Cap. XXV.

[b] *Remarks on ſeveral places in* Italy, *Pag.* 377.

Fig. 4.

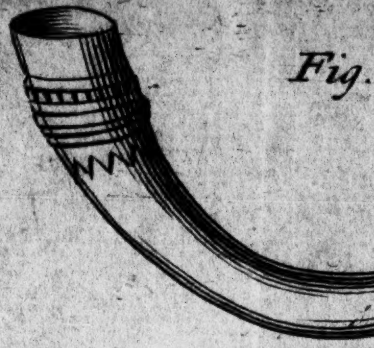


Fig. 1.

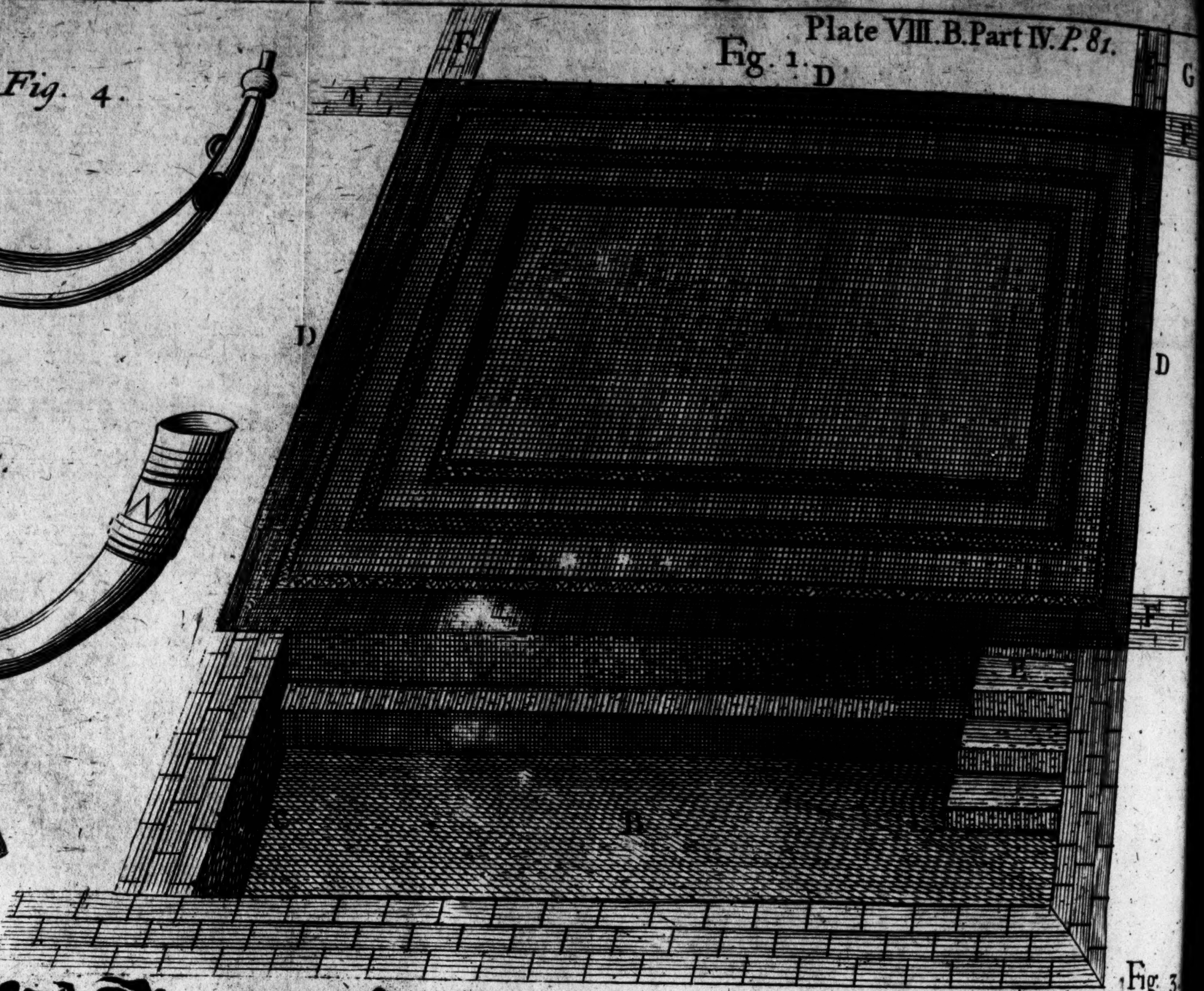


Fig. 5.

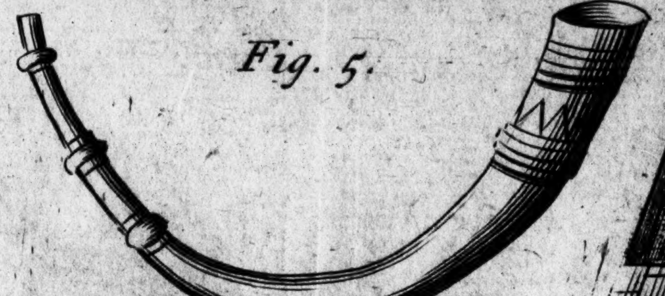


Fig. 6.

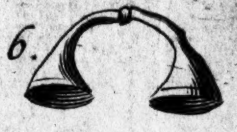


Fig. 7.

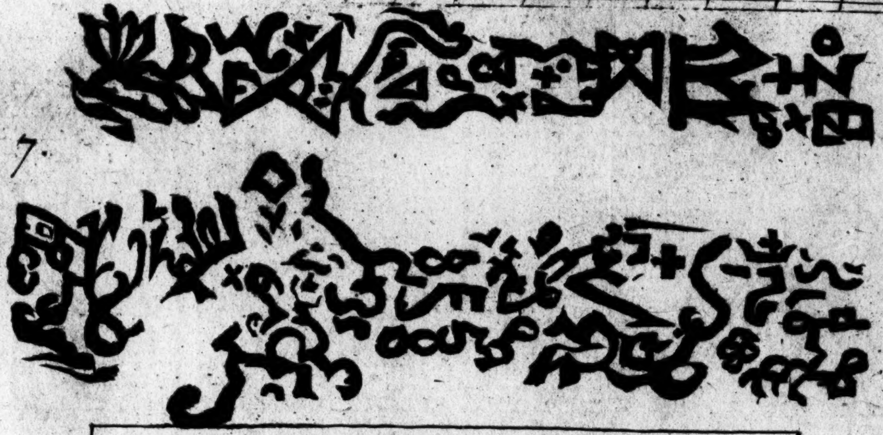


Fig. 2.

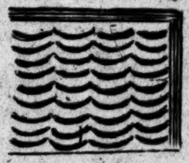
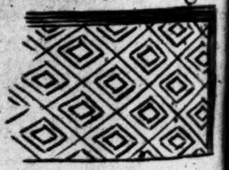
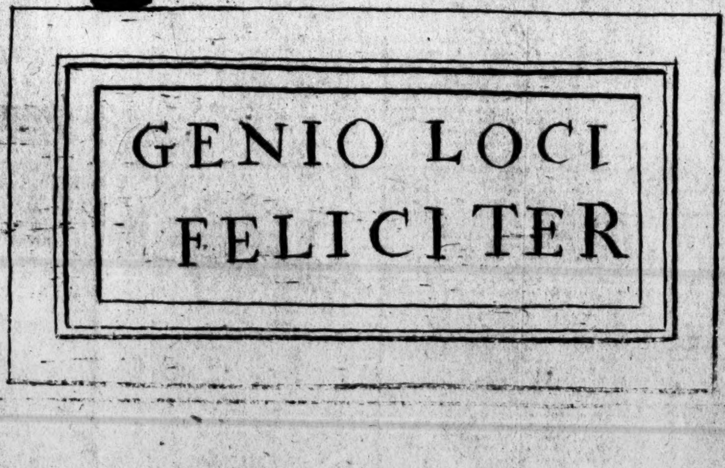


Fig. 3



A. *The Pavement.* B. *The Bath.* C. *The Sink an*
the other Paſsage through the Wall at the East
end of the Bath. D. *The Roman Brick which bou*
-ed the Pavement, laid flat and covered with
Terrace. F. *Foundations continued severall wa*
E. *The Landing place out of the Bath.* G. *The*
corner of a large space paved with Roman
Brick, and covered with Ashes, Coals. &c.

Fig. 8.



GENIO LOCI
FELICITER

on the *Lithoſtroton* [c]; which Appellation was given to theſe kinds of Pavements by *Varro* [d] not leſs than ſixty Years before; and by *Pliny* [e] not leſs than forty Years after our Saviour's Suffering. That the Roman Generals caus'd ſuch Pavements to be made at their Stations; we may have juſt reaſon to conclude, from that paſſage [f] in *Suetonius* cited for this purpoſe by Dr. [g] *Plot*.

When the Ground about the Pavement was dug, all theſe Suppoſitions were quaſh'd; for on the North ſide of the Pavement, we diſcover'd an entire Bath, ſixteen Foot long, five Foot nine Inches broad, and two Foot nine Inches deep (which the Draught ſent with this repreſents): *Fig.* 1. Plate 8. It was fill'd with Rubbiſh of Buildings, which ſeem'd to have been burnt; *ſc.* hard Mortar adhering to pieces of Roman Brick, ſquar'd Stones, and headed Flint, mingled with Aſhes and Coals of Wood. From the North-weſt corner of the Pavement, was the Paſſage into the Bath, three Foot three Inches wide; at which place, the Bricks that bounded the Pavement were not turn'd up at their ends, but lay even with the *Teſſeræ*. At the diſtance of fifteen Inches from the *Teſſeræ*, there was a Fall of two Inches, to the Landing-place out of the Bath; the Landing-place was alſo three Foot three Inches long, and two Foot two Inches broad: Thence by two Stairs, was the Deſcent into the Bath; the length of the Stairs, the ſame as of the Landing-place; the breadth of each Stair was eleven Inches; the height of each Step a little more than ten Inches; the loweſt Stair was twenty Inches from the fartheſt Side of the Bath. The whole Work was very compact, and exactly well made; not in the leaſt injur'd by time, nor the Violence it underwent when fill'd up; truly anſwering the Precepts of *Vitruvius*; which [h] adviſe, that for all Buildings, reſpect ſhould be had to the Strength, Conveniency, and Beauty of the Work deſign'd; and that in order thereto, a careful and judicious Proviſion ſhould be made of Materials, without Parſimony.

Although the Author and Time of theſe Works cannot as yet be diſcover'd; 'tis evident the Artificer near enough follow'd the Directions *Vitruvius* [i] gave for framing ſuch like Structures.

Firſt, as to the Pavement, it was ſecur'd on every ſide, and the Edges of it reſted on a very firm and neat built Wall, made of Roman Brick, ſquar'd Stone and headed Flint; between five and ſix Foot deep below the Surface of the Pavement, and full twenty three Inches thick; which we may ſuppoſe to have been two Foot by the Roman Meaſure. The Bricks were not in regular courſe, as they are to be ſeen in thoſe Roman Buildings, which are in view above Ground; but without order diſpers'd about in the Wall. The Top of the Wall indeed was but fifteen Inches thick; and that was cover'd with the Bricks firſt mention'd, which bounded the Pavement: But about fourteen Inches below the Top, there was a Set-off (as our Maſons term it) in the Inſide of the Wall eight Inches broad. We did not dig up the Foundation of the Pavement to the Bottom, but opened it at one Corner only, that we might diſcover how it was Fram'd; for when it was bor'd through, they obſerv'd, next under the *Teſſeræ*, a Bed of very ſtrong Mortar, more than a Foot thick; under the Mortar a Bed of Clay two Foot thick; and under the Clay a firm Foundation of Brick. We obſerv'd the Clay (which the Grounds thereabouts do not afford) to be very fine and red, and alſo cloſe; no doubt but carefully Ramm'd. The Surface of the Clay was neatly pitch'd with ſmall Flint and Stones, Pointed at their lower ends, and Headed at their upper ends. This Pitching or Paving is by *Vitruvius* call'd *Statuminatio*; and the Stones 'tis done with, he calls *Statumina*. He directs them to be ſet, when the Underwork is made Sound and Firm by well Ramming.

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[c] Εὐαγγ. Ἰωαν. Ch. XIX. 13. [d] Ter. Var. de Re Ruſt. Lib. 3. [e] Plin. Hiſt. Nat. Lib. XXXVI. Kc. 25. [f] Jul. Cæſ. Sect. 46. [g] *Oxfordſhire* Plot's Nat. Hiſtory, c. X.

[h] De Architect. l. II. c. 3.

[i] Lib. VII. cap. 1.

This pitch'd Work was exactly even with the Set-off in the Inſide of the Wall; on it was laid a Bed of coarſe Mortar of about nine Inches thick; the Skirts of this Mortar (which by *Vitruvius* is call'd the *Rudus)* reſted on the Set-off abovemention'd; it was compos'd of Lime, a ſharp coarſe Sand, ſmall Pebbles, and bits of Brick. Upon this *Rudus* was a finer Compoſition made, as near as I could gueſs, with Lime, a fine ſharp Sand, ſome kind of Aſhes, and (which was the greater part) ſtampt Bricks and Potſherds, in grains not larger than Cabbage-Seed, and the Flower or fine Powder ſeparated from it. This Bed was about half a Foot thick; and is what *Vitruvius* calls the *Nucleus*. Whether we may call it Terrace, I muſt leave it to thoſe who are better skill'd than my ſelf, in giving proper Appellations to the ſeveral parts of Maſonry. Both this *Nucleus* and the *Rudus* under it, very near equall'd the *Portland* Stone in hardneſs and compactneſs. Upon this *Nucleus* or Terrace were the *Teſſeræ* ſet; they were ſet an end: but ſo exact was the Workman in ſetting them, that he us'd two ſorts of Cement to fix them withal; their lower ends ſtood in a Cement of Lime only, well work'd; their upper halves were cemented with a fine gray Mortar, conſiſting of fine Sand (and as it ſeem'd) Aſhes and Lime. This gray Cement every where fill'd the Intervals at their Heads; and was much harder than the *Teſſeræ* themſelves.

'Twas before intimated, that the *Teſſeræ* were but of two Colours, White, and of a dark Brown; they were harder than a glaz'd and well burnt Tobacco-Pipe, and of a Grit ſomewhat finer; the Brown ſeem'd to be of the ſame Subſtance with the White, but colour'd by Art, (as *Pliny* informs us[k] the Workers in Clay of old had a method to do;) they ſeem to have been form'd in a Mould, and afterwards Burnt. Hence I am inclin'd to take the meaning of *Vitruvius*; where he makes ſo plain a diſtinction between the *Teſſeræ*, and the *Sectilia*; that the one was according to the Import of the Name, form'd by Inſtruments out of Stone, Brick, and Tile; the other ſhaped in a Mould and Burnt. They were not of an equal ſize, none exceeding an Inch in length; the ſhorteſt were $\frac{6}{10}$ of an Inch; moſt of them were equally made their whole length; but of ſome the lower ends terminated almoſt as ſharp as a Wedge, on purpoſe, as may be ſuppos'd, to be driven where any Interſtices were left: At their Heads likewiſe they were not all equal and alike, ſome exactly Square, ſome oblong Square, ſome Semilunar, but none Triangular; the Diameter of thoſe that were Square was about $\frac{4}{10}$ of an Inch; the longeſt ſide of thoſe that were oblong at the Head little exceeded half an Inch. It may be obſerv'd, that the preparations for fixing this Pavement here, go beyond thoſe which *Vitruvius* preſcribes (in the firm Wall near ſix Foot below the Surface, in the Bed of Clay within it two Foot thick, and in the Foundation of Brick under the Clay). But when we conſider the Situation of the Ground here is low, not many Feet higher than the Sea might be elevated at Spring Tides; and that it might as well be annoy'd by Land-Springs after great Rains, as by Water owzing through the Earth from the Sea ſo near; from which the Work in time might receive damage: we muſt allow the abovemention'd Additions to be the reſult of a very judicious Foreſight.

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[k] Plin. Secun. Hiſt. Mund. Lib. XXXV. c. 12.

The Bath alſo was form'd and ſecur'd by a very compact Wall, of the ſame breadth and depth with that on which the Pavement reſted; the Wall, which ſuſtain'd the North Side of the Pavement, made the South Side of the Bath. On the South Side of the Bath, from the Eaſt end, to the ends of the Stairs, there was a ſolid Seat; twelve Foot nine Inches long, very near ten Inches broad, and fourteen Inches high. The Bottom or Floor of the Bath, was made after the ſame manner as the Pavement was made, excepting the *Teſſeræ*, and the thick Bed of Clay; for under all, there was Brick; then a Bed of the *Rudus* or coarſe Mortar ſomewhat more than a Foot thick; above that the *Nucleus* or Terrace only, half a Foot thick. The Sides of the Bath, the Seat, and the Stairs, were plaiſter'd over with this Terrace about half an Inch thick; all which were throughout ſo Hard, Compact, and Smooth, that when firſt open'd, the whole ſeem'd as if it had been hew'd out of one intire Rock and poliſh'd. At the middle of the Eaſt end, at the Bottom, there was a Sink-hole, a little more than three Inches long, and above two Inches deep; about four Inches above it, there was another paſſage through the Wall of the ſame ſize; the firſt we may ſuppoſe to let out the Water which had been us'd; the other to let in freſh. The Stairs and Seat were chiefly made of *Roman* Brick, between fifteen and ſeventeen Inches long, between eleven and twelve broad, and near one and an half thick. At the North Side of the Bath the Ground was not open'd; but at the Eaſt end of the Bath and Pavement, at the South Side of the Pavement, and at the Weſt end of both there ſeem'd to have been ſeveral Vaults or Cellars; for there were very firm 23 Inch Walls continued every way (to the farther ends of which we did not trace) whoſe Foundations were as low as that which ſupported the Pavement; ſo that to the depth of ſix Foot, the Ground was fill'd with ſuch Rubbiſh as was taken out of the Bath. The Bricks in this Rubbiſh, which were all broke, had ſeveral degrees of thickneſs, from three Inches to a little more than one Inch; ſome had one of their Sides wav'd as in *Fig.* 2. ſome Fretwiſe as in *Fig.* 3. others had Roſes on them well imitated; we found alſo two ſorts of chanel'd Bricks; the one like a Trough, the Chanel three Inches broad, and as many deep, the Brick itſelf an Inch and an half thick: The other ſort, had a Cylindrical Chanel; ſo that when two were clapt together, they form'd a hollow Cylinder of three Inches Diameter. Theſe chanell'd Bricks being all broken, their Length when whole is uncertain, as is the Uſe they ſerv'd to; whether for Paſſages to conveigh Water; or whether they were placed in the Walls to diſtribute Heat throughout the Building, as was uſual in the ancient Structures at *Rome*.

'Tis farther obſervable, when the Ground was open'd the ſecond time; that off from the South-Weſt corner of the Pavement, which the Letter G ſhews; five Foot lower than the Surface of the Pavement, there was diſcover'd a large Space (to the end of which we did not ſearch) pav'd with Brick, eleven Inches broad, almoſt one and an half thick, and fifteen long; ſubſtantially was it pav'd; for it had two Courſes of this Brick. There was half a Foot of Mortar under the lower Courſe; and about an Inch of Mortar between the two Courſes; theſe Bricks alſo were perfectly well made; but on the under Side of each, were two Knobs, about the ſize of half a Wallnut; fix'd on them as may be gueſs'd, to keep them ſteady, till the Mortar they were ſet in might dry. This pav'd Place was ſearcht 6 or 8 Foot every way; it was all cover'd with a Coat about two Inches thick, of Aſhes and large Coals of Wood: On that lay confuſedly large pieces of the *Rudus* or coarſe Mortar abovemention'd, and lumps of the *Teſſeræ* in all reſpects like thoſe on the Pavement, and cemented as they were. There were moreover mingled with the Aſhes many large Iron Nails, bigger, but not quite ſo long, as thoſe we call double Tens; ſome Hooks for Doors to ſwing on; ſeveral ſmall pieces of earthen Ware; ſome like bits of Urns; ſome of a fine yellow clay; ſome red, thin, neatly wrought and adorn'd with Flowers; and laſtly part of a human Skull, and pieces of Bones near it; which Bones were not incloſ'd in any Veſſel, but lay looſe; they were diſcolour'd like thoſe I have ſeen in Urns; ſo that the Body they belong'd to, might periſh by the ſame Flames, that theſe Buildings were deſtroy'd by. There was no Inſcription found either on Stone or Brick; no Statue, or other Figure, ſave thoſe on the Bricks mention'd; neither were there any Coins met with there. But ſomething more than a Furlong North-Weſt of theſe Works, near three Years ſince was a Malt-houſe, and near two Years ſince a Dwelling-Houſe erected; in digging the Foundations for the firſt, there was a Coin of *Poſthumus*; and in the Ground dug for the laſt, a piece of *Conſtantine*'s found.

From the nearneſs of the Bath, it may reaſonably be concluded that the Pavement was neither a part of a Temple, nor for a place of Juſtice: the continuation of the Foundations every way to be traced from it, and what was laſt diſcover'd, are rather an Argument it was an Apartment of a magnificent Palace.

Pliny ſuppoſed that theſe *Lithoſtrota* [1] or teſſerated Pavements had their original in *Greece*; but perhaps the *Grecians* borrow'd their Patterns from

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[1] Plin. Nat. Hiſt. Lib. XXXVI. c. 25.

Aſia: for from the Book of *Eſther*[m] we learn, there was a moſt Royal Banquet at *Suza*, on a *Lithoſtroton* (ſo the Septuagint has it) of coſtly Stones, four undred Years before the time of *Sylla*, who brought them firſt into *Italy*. *Joſephus* affirms[n], that the *Grecian* Laws, Learning and Arts were fetch'd from *Aſia:* and indeed when we reflect on the Antiquity of the *Levitick* Law; the Pyramids of *Egypt*; the Temple of *Solomon*; the Walls and Palaces of *Babylon*; and the ſumptuous remains of *Palmyra* and *Perſepolis*; we have no reaſon to eſteem the *Grecians* Authors, but as good Imitators of thoſe early Examples of Learning and Arts they had to follow.

When *Quintus Cicero* was here with *Cæſar*, the ſecond time he invaded *Britain*; his Brother the incomparable *Tully*, had the overſight of ſome Buildings he had appointed to be made in the *Villa Manliana* at *Arcano:* and in a Letter ſent into *Britain*, *Tully* informs *Quintus*, that he was well pleas'd with the Seat, and more, becauſe the *Pavimented Piazza* was Magnificent: that the Pavement ſeem'd[o] to be exactly well made: that he had directed ſome Chambers to be alter'd becauſe he did not approve of them: that in the Bathing Apartment, he had remov'd the Sweating Room into another corner of the *Apodyterium*. And afterwards in the ſame Letter makes mention of ſuch another Work which was in hand for him in the City alſo. Again, about the time *Quintus* return'd out of *Britain*, and was fixt with the Legion he preſided over, in Winter Quarters among the *Nervii* (of which *Cæſar* in his Commentaries makes mention); *Tully*[p] takes notice of a Pavement that was making for himſelf alſo: *Expolitiones utriuſque noſtrum ſunt in manibus; ſed tua pœne ad tectum jam perducta res eſt ruſtica Arcani & Laterii.* 'Tis hinted by *Varro* that a *Lithoſtroton* was one of the Members of a compleat *Villa*[q]: *Varro* was eighty Years old when his Books *de Re ruſtica* were compoſed: *Tully* was ſomething more than fifty when the above cited Epiſtles were wrote; *Cæſar* when a General, made the *Teſſeræ*[r] and *Sectilia* for Pavements, to be part of his Baggage; and *Vitruvius*, Cotemporary with theſe three, calls the *Lithoſtrota*, *Principia Expolitionum*[s]; which make it evident theſe Floors were held in eſteem, by as great Men as the World has afforded, even in their riper Years. From all this, we may obſerve, that ſometime before, and in the firſt Age of the Empire, the humour of theſe kinds of Floorings much prevail'd among the *Romans:* wherefore 'tis no wonder they are found in ſo many places of this Iſland. But, as unprofitable Inventions and Cuſtoms in time grow Stale, and are laid aſide, ſo fared it with that of the Pavements: For in the time of *Pliny* they began to be out of uſe on the Ground; but then he tells us, they were made above Stairs[t], or in his own Words in Chambers. Whether the *Lithoſtrota* in Chambers were uſual in *Vitruvius*'s days, we have no Warrant to ſuppoſe, from any hint in his Writings; notwithſtanding he gives Rules for making them, *plano pede*, on the Ground; and *ſub* [u] *dio*, (which from the Method by him preſcrib'd muſt be) aloft: becauſe for ſuſtaining thoſe *ſub dio*, he orders the Work underneath to be well ſecur'd, with two lays of Plank that ſhould croſs [w] each other, and be nail'd down; then the *Statuminatio* or Pitching the Mortar, Terrace and *Teſſeræ*; as before on the Ground. But becauſe by *ſub dio Vitruvius* could not deſign Chambers; and although *Pliny* informs us the *Græcians* us'd [x] to cover or Flat-roof their Houſes with theſe Pavements; yet ſince neither *Vitruvius* nor *Pliny* mention any ſuch Mode prevailing in their times at *Rome*; it remains, that we may imagine *Sub dio*, or the *Subdialia* of *Vitruvius*, to mean Pavements mounted on Pillars or Arches, which might afford delightful Terraces out of the upper Rooms, and ſhady Piazzas underneath: and in this Senſe perhaps may be underſtood the *Porticus Pavimentata* of *Tully* above-mention'd. By the many Apartments the Foundations about theſe Works point out, there ſeems to have been nothing wherein the Buildings that once ſtood there, might come ſhort of the magnificent Structures, wherewith the *Romans* delighted to gratify their Luxury. The uſes each were deſign'd for, are not to be determin'd: whether there was a Piazza cover'd with a *Lithoſtroton*, cannot be affirm'd. But be that as it will; 'tis next to Demonſtration, there was ſome upper Floor ſuſtain'd by Wood, and pav'd with the *Teſſeræ*, after the ſame manner as *Vitruvius* directs; and, on the Brick Pavement (laſt diſcover'd,) the Coat of Aſhes and Wood Coals with Nails; cover'd with large pieces of the *Rudus*, and great lumps of the *Teſſeræ* well cemented together; and the *Nucleus* adhering to them, ſhew there was an upper Pavement broke by its Fall, when Fire had conſum'd its Support.

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[m] Eſth. Chap. I. ℣. 6. [n] Joſeph *againſt* Apion. Book II. [o] Tull. Cic. ad Quinct. Frat. Lib. III. Ep. I. [p] Ibid. Ep. III. [q] Ter. Varro de Re ruſtic. Lib. III. [r] Suet. Tranq. Jul. Cæſ. Cap. 46. [s] M. *Vitruv. Pol.* Lib. VII. Cap. I. [t] Plin. Hiſt. Lib. XXXVI. Cap. XXV. Pulſa deinde ex humo Pavimenta in cameras tranſiere è vitro; novitium & hoc inventum.

2. We cannot have a leſs Senſe of the Rules and Methods the *Roman* People made uſe of, in framing their Buildings and other Conveniences for Enjoyment and Magnificence, than of their Managements in Military Preparations and Diſcipline: When they deſign'd a Building, they could not immediately begin it; their Preparations requir'd Time. *Vitruvius* [y] and *Pliny* both direct that Brick be form'd in the Spring, and be two Years drying. And *Pliny* [z] ſays, 'twas ordain'd by the old Laws of *Rome*, that no Undertaker ſhould build a Houſe with Mortar, that had not been made three Years before.

Of the Site of ſome Roman *Towns in* Suſſex, *by the ſame. n.* 356. *p.* 783.

2. Where *Tacitus* ſpeaks of *Britain* and its Affairs, his Deſcriptions are ſo lively deliver'd, that one would think himſelf had been here, with his Wife's Father *Agricola*; and where he mentions the *Iriſh* [a] Prince, the Expreſſion by him us'd ſeems to give Strength to ſuch a Suppoſition.

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[u] M. *Vitruv.* Lib. VII. Cap. I. Sub dio vero maxime idonea faciunda ſunt pavimenta. [w] Ibid. itaque ſi neceſſitas coegerit, ut minime vitioſa fiant, ſic erit faciundum; cum coaxatum fuerit, ſuper altera coaxatio tranſverſa ſternatur, claviſque fixa, *&c.*—— Statuminatione facta rudus inducatur, *&c.* [x] Plin. Hiſt. Lib. XXXV. Cap. XXV. Subdialia Græci invenere talibus domus contegentes. [y] M. *Vitruv.* Fol. Lib. II. Cap. III. Plin. Hiſt. Lib. XXXV. Cap. XIV. [z] Plin. Hiſt. Lib. XXXVI. Cap. XXIII. [a] Tacit. Vit. Agric. cap. XXIV.

The gaining the Southern part of this Iſland, was the greateſt, if not the only Acquiſition, made to the *Roman* Empire, from the Death of *Tiberius* to the Sixth Year of *Claudius*; which we may well ſuppoſe was not paſs'd over in ſilence by that excellent Hiſtorian *Tacitus:* But his Four Books of Annals, which contain'd the Tranſactions of thoſe Nine Years, we have reaſon enough to fear, are irretrievably loſt. From the mention *Suetonius* makes of *Claudius* his Expedition hither; 'tis commonly inſinuated his Conqueſt here [b] coſt no Blood. Our Countryman *Bede*, we may ſee, was of that opinion; becauſe, in the Account given by him of *Claudius*, the Words of *Suetonius* [c] are copied. But *Dio Caſſius*, from whom we have the moſt particular Information of that War, gives a quite different Relation of the Matter: He takes notice of at leaſt Four Battles, fought with the *Britons* (before *Claudius* came over) by *Aulus Plautius*; who had *Flavius Veſpaſianus*, *Flavius Sabinus*, and *Hoſidius Geta*, that commanded under him: In the firſt Conflict, *Cataratacus* was defeated; in the ſecond, *Togodumnus*, and, as may be inferr'd from his Words afterwards, ſlain. From the manner of his delivering the Story, all thoſe Battels ſeem to have been fought, South of the River *Thames*, and North of the *Sylva Anderida*, except the laſt; and that in the firſt Campaign the Conqueſts of *Plautius* could not have extended beyond *Kent* and *Surry:* For it's likely [d] that the Two firſt Actions happen'd about the Skirts of the *Sylva Anderida*, Eaſtward of the River *Medway*; and the Third, which held Two Days, on the Banks of that River; becauſe, from the River, where they were routed Two Days ſucceſſively, the *Britons* retiring, aſſembled [e] their Strength again before their Fourth Overthrow, in that part of *Kent* which borders on the *Thames*, not far from its entrance into the Sea; and having paſs'd it, were follow'd by *Plautius* his *Germans*, and on the other ſide put to flight; which was the Fourth Action mention'd by *Dio*. *Claudius* having been ſent for, comes the Second Year with powerful Succours to the Aſſiſtance of *Plautius*; who with his Forces waited his Arrival near the *Thames*, not unlikely ſtill where he quarter'd in the Winter; which perhaps was in that large ſtrong Camp, as yet to be ſeen [f] not far from *Bromly* in *Kent*, on the River *Ravensbourn*. The Emperour joining him [g], immediately croſs'd the *Thames*; overthrew the *Britons* poſted on the other ſide to reſiſt him; advanced to *Cynobelin*'s chief Reſidence *Camalodunum*, and took it: Then receiving Homage of ſome States, return'd to *Rome*.

Conſidering therefore that *Claudius* ſtaid but ſixteen Days [h] in this Iſland, we muſt conclude his Diſpatch was great; and that his Progreſs could not have been through more Parts than *Kent*, *Eſſex*, *Hertfordſhire*, *Middleſex*, and *Surry*. As to what elſe relates to the *Britiſh* War in the time of *Claudius*, ſave that three Years after *Titus* reſcued his Father *Veſpaſian* when in great danger, we have no Account from *Dio*. But where *Suetonius* [i] treats of *Veſpaſian*'s Life; we are told, that when that Emperour commanded in *Britain* for *Claudius*, he fought thirty Battels, ſubdu'd Two of the moſt powerful Nations, won twenty Towns, and brought the Iſle of *Wight* under the *Roman* Obedience. Of which Actions, beſides what might have been ſaid in the loſt Books of Annals; *Tacitus*, in other Pieces of his, largely [k] hints, that when *Claudius* rul'd, *Veſpaſian*'s Behaviour and Succeſs in this Iſland, ſhew'd to the World his Conduct and Courage in the Affairs of War: The ſame is alſo taken notice of [l] by *Dio*. From his Conqueſt of the Iſle of *Wight*, it may be imply'd, the Stage of his Actions here, was in thoſe Countries which border on the South Channel rather than in the North: Since therefore the Clime, the Soil, and the more ready Conveniencies for foreign Trade and Correſpondence, might entitle this Part of the Land, to ſuſtain as numerous, as ſtout, and as experienc'd a People as any other (becauſe *Cæſar* [m] takes notice they not only lent Aids to the *Veneti* in their Revolt, but were wont to aſſiſt the *Gauls* in moſt of their Wars againſt [n] the *Romans*:) And whereas no Hiſtorian afterwards mentions any Diſturbance given to the *Romans* from the Southern Parts; we may conclude, *Veſpaſian* entirely ſubdu'd them; and that before he left the Iſland, the Methods he eſtabliſh'd for ſecuring Peace were no way inferior to thoſe he had ſhewn in making War.

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[b] Suet. Claud. cap. 17. [c] Beda Eccleſ. Hiſt. Gent. Angl. Lib. I. cap. 3. [d] Dionis Caſſii Hiſt. Rom. Lib. LX. Claud. V. p. 768. A. [e] Pag. 678. D. [f] Camden Brit. Edit. 1695. Col. 213. c. [g] Dion. Caſſi. Hiſt. Rom. Lib. LX. pag. 679. B. [h] Dion. Lib. LX. pag. 680. B. [i] Suet. Veſpaſian. cap. 4.

The *Romans* well knew, that thoſe who were Strangers to Civility, could not without great Difficulty be kept in Obedience: As ſoon therefore as the Countries they had conquer'd, were reduced to ſome degree of Quiet; they endeavour'd to make the People in love with their Government, by introducing their Arts and Cuſtoms among them: From that inconſiderable Inſtance recorded [o] by *Pliny*, we may ſee, how ready the *Romans* were to oblige the People under their Power with any Curioſity that might entertain their Senſes, in order to endear them to the Authority they had over them. (He tells us, Cherries were not known in *Italy*, till the 680th Year of *Rome*, when *L. Lucullus* firſt brought them thither from *Pontus*; and that in a Hundred and Twenty Years, they were ſo increas'd, that not only many other Countries, but *Britain* alſo was ſupply'd with them; which muſt have been about three Years after *Claudius* himſelf had been here. The uſual Landing from *Rome* being then in the County of *Kent*; that Fruit without queſtion was there firſt planted; and the Soil well agreeing with it, may be the reaſon that the beſt and greateſt Quantity of it is yet there to be had.)

Agricola, in the Second Year of his Lieutenancy here, when in Winter-Quarters, purſu'd the ſame Maxims (which *Tacitus* terms *Saluberrima Conſilia*; and, as it may be inferr'd from an Expreſſion of [p] *Cæſar* conducive to the ſame End) to gain the *Britons*, by making them acquainted with the *Roman* Manners: He not only in private perſuaded, but publickly help'd and incourag'd them to build Temples, Places for common Aſſemblies, and private Houſes after the *Roman* Mode: He took care to have the principal Youth inſtructed in the Liberal Arts: He allur'd them to affect the Habit of the *Romans*: And at laſt of all to engage them the more firmly, help'd them to a Taſt of the *Roman* Luxury and Goodfellowſhip, by introducing the Uſe of ſhady Piazzas and Baths[a], and their way of Banquetting. But here, *Tacitus* may be underſtood to ſpeak of what was done in order to civilize the Northern Parts of this Nation, where *Agricola*'s Preſence was required: The Southern was, we may ſuppoſe, ſoftned and quieted by the ſame Methods near forty Years before, when reduced by *Veſpaſian*.

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[k] Tacit. Agricol. cap. xiii. Tacit. Hiſt. Lib. III. cap. xliv. [l] Dion. Caſſ. Hiſt. Rom. Lib. LXV. p. 736. C. [m] De bello Gal. Lib. III. [n] Idem Lib. IV. [o] Plin. Lib. XV. cap. xxv. [p] De Bell. Gallic. Lib. I.

From hence it may be inferr'd; that ſhould never any other Tokens of the Antiquity of theſe Works be found; yet would the *Bath* denote the Age of the Pavement, and ſet it near as high as the moſt early Time, that the *Romans* had any real Authority in this Iſland.

As by the Loſs of ſome of the Annals of *Tacitus*, we may have been depriv'd of the moſt early Hiſtory of this County; ſo likewiſe, for want of antient Religious Houſes; there has been little or no Account left of its Circumſtances, in the Times next after the *Roman* Authority expired here. *Malmsbury* [b] ſays, that in his Time, there were here only the Abbies of *Batteli* and *Lewes*, and thoſe not long erected. The earlieſt Mention made of it, is by [c] *Bede*, who informs us, that Biſhop *Wilfrid*, in the Year 678, being thruſt out of his Province of *Northumbria* by King *Ecgfrid*, ſettled at *Selſey* in 680, and ſtaid five Years, labouring in the Converſion of the neighbouring Parts; but of what elſe relates to the County, ſave the miſerable Ignorance of the Inhabitants, and the Number of Families, he has left no Account. *Bede* ſpent moſt of his Time in the Monaſteries of *Wiremouth* and *Jarrow*, and travel'd little; ſo that (conſidering the Diſtance from thence to this County, and the different Governments and Intereſts that lay between, he may well be excus'd for the few Particulars he has left us of it.

The next Records we have to view are thoſe of *Ethelwerd*, the *Chronicon Saxonicum*, and *Henry* Archdeacon of *Huntingdon*. But that you may the more clearly apprehend the ancient State of this County; look into the beſt Map of it you can get. At the Weſt End, you will find *Weſt-Harting* and *Stanſted*, diſtant from each other ſix or ſeven Miles; imagine a ſtreight Line to be drawn from *Harting* to *Bourne* near *Pevenſey*, and another to be drawn from a Point which muſt be little South of *Stanſtead* to *Brighthelmſtone*: What lies North of theſe Lines is the Weald or Low-lands, formerly the *Sylva Anderida*; that which is comprehended between theſe Lines, and bounded by the Sea from *Brighthelmſtone* to *Bourne*, is the *Downs*, ſo famous for their pleaſant Situation and Fruitfulneſs. The Part South of theſe Lines, is a flat champaign Ground, ending like a Wedge at *Brighthelmſtone*. Theſe two laſt Parts were thoſe only that were inhabited in *Bede*'s Time;

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[a] Tacit Agricol. cap. xxi. [b] Gul. Malmſb. de geſtis Pontific. Angl. Lib. II. [c] Bedæ Hiſt. Eccleſ. Lib. IV. cap. xiii.

they contain not more than Two Fifths of the whole County; which muſt be the reaſon why *Bede* ſaid, *Suſſex* [d] conſiſted not of more than 7000 Families or Farms; whereas in another place he computes *Kent* to have 15000 Families.

In the three Accounts [e] above-mention'd, 'tis agreed, that in the Year 477. *Ella*, with his three Sons *Cymen*, *Wlencing*, and *Ciſſa*, landed his Forces at *Cymenes-Ora* (which from a Charter of King *Cedwallas* to the Church of *Selſey* the learned [f] *Camden* proves to be about *Wittering* near *Selſey*;) not far from which he routed the *Britons*, and drove them into the Weald (**Andredeſleige**): Their farther Progreſs is moſt diſtinctly and naturally deliver'd by the Archdeacon of *Huntingdon*, in theſe Words; *Saxones autem occuparunt littora Maris in* **Sudſexe**, *magis magiſque ſibi regionis ſpatia capeſſentes, uſque ad nonum annum adventus eorum. Tunc verò cùm audaciùs regionem in longinquum capeſſerunt; convenerunt Reges & Tyranni Britonum apud* **Mercredesburne**, *& pugnaverunt contra* Elle *& filios ſuos, & fere dubia fuit victoria. Uterque enim Exercitus valdè læſus & minoratus, alterius congreſſum devovens, ad propria remearunt. Miſit igitur* Elle *ad compatriotas ſuos auxilium flagitans.*

This County having been invaded in the moſt Weſtern part of it by the *Saxons*; if what they did afterwards, was to poſſeſs themſelves of it, their Progreſs muſt have been from Weſt to Eaſt: And ſo much *Henry Huntingdon*'s Words plainly imply. He ſays farther, they were eight Years about it; which, if we conſider the Circumſtances of the Country, 'twill be no great wonder it ſhould take up ſo much Time; unleſs the Forces had been very great, which we have no warrant from any Hiſtory to ſuppoſe: For the *Weald* then uncultivated, muſt have been moſt difficult to paſs, even in the drieſt Summers. The *Downs*, like a Wall (with a Terras-Walk on the top) have a very ſteep Deſcent into it, their whole Length; excepting, that every ten Miles, or thereabouts, they have deep Chanels through them to afford Paſſage for the Rivers into the Sea: Therefore, what was then habitable, being thus canton'd out into ſo many Parcels by the Rivers; nothing could be more difficult to gain than thoſe Cantonments; were there any Forces to defend the Paſſes that ſhould have been attempted; the Rivers being deep and muddy, and the Moraſſes on each ſide broad and boggy: Hence we may conceive, 'twas no very difficult Task for the *Britons* to defend, nor an eaſy one for the *Saxons* to gain the Country. And indeed, the many old Camps, ſtill to be ſeen on the *Downs*, are an Evidence that ſcarce any part eſcaped being a Scene of War. Mr. *Camden* mentions but two, *Ciſsbury* and *Chenkbury*. In the new Edition of his Works, Dr. *Harris* has added three more; a *Roman* Camp at the *Brile* near *Chicheſter*, St. *Rooks-hill* and *Gons-hill* near the Weſt Limits of the County. It may not be improper here to inſert an Account of the reſt; in which, I ſhall firſt take notice of thoſe that are on the North Edge of the *Downs*, and overlook the *Weald*.

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[d] Bedæ Hiſt. Eccleſ. lib. IV. cap. 13. [e] Ethelward Hiſt. Lib. I. cap. 5. Chronic. Saxon. Ann. CCCCLXXVII. Hen. Hunt. Hiſt. Lib. II. [f] Camden. Brit. Suſſex.

Firſt, *Chenkbury*, mention'd by Mr. *Camden*, two Miles Weſt of *Steyning*, and about three Miles North of *Ciſsbury*; 'tis circular; its Circumference about two Furlongs. From *Chenkbury* eight Miles Eaſt, over *Poynings*, is a very large one, an Oval, not leſs than a Mile round; acceſſible at one narrow Neck only, and that fortify'd with a deep broad Ditch, and a very high Bank: I could never learn any other Name it has gone by, than *Poor-Man's Wall*; perhaps from its having been a Security to the diſtreſſed *Britons*. About three Miles Eaſt from thence, is *Wolſenbury*, on a Hill, projected beyond the reſt of the *Downs*, like a Baſtion; it comes near a Circle in ſhape; its Diameter a little more than a Furlong. Near three Miles Eaſt of *Wolſenbury*, on the higheſt part of the *Downs* in that Quarter, is a Camp, near ſquare, about 60 Rods long, and 50 broad; much like a *Roman* Camp; the ſide next the North is ſecur'd by the Precipice of the Hill, which is both very deep and ſteep; the other three Sides have each their *Portæ* after the *Roman* manner ſtill very viſible; the Ditch ſeems to have been not leſs than eleven Foot broad; but the Ground having been plough'd, the Bank is but low: This is call'd *Ditchling*, as is the old Town under it. Near ſeven Miles farther Eaſt, and a Mile and half Eaſt of *Lewes*, is the laſt on the North Edge of the *Downs*; it goes by the Name of *Caburn*, which perhaps is but a Corruption of the *Britiſh* Word *Cadir*; the Pariſh below it, ſtill retains its *Britiſh* Name *Glynd*: This is a round Camp, ſcarce three Furlongs in Circuit; its Ditch very broad and deep, and the Rampart within very high; the Places where the Tents were pitch'd are yet viſible; which, from the Strength of the Out-Works, intimates that thoſe within held it no ſmall time. Near a Quarter of a Mile Weſt of it, there is a ſtrong work much larger, but not ſo perfect; yet enough to ſhew, it was made to ſecure a Power, that might lie there to bridle thoſe in the ſtrong Camp, and prevent their making Excurſions towards *Lewes*.

The Camps on the Southern Limits of the *Downs*, are St. *Rooks* near *Chicheſter*. *High-Down*, a ſmall Square four Miles Eaſt of *Arundel*, and in the Pariſh of *Goring*. *Ciſsbury* four Miles South-Weſt of *Steyning*. *Hollingbury* is the only one in the middle of the *Downs*, two Miles North of *Brighthelmſtone*, and three Miles South of *Ditchling*; 'tis a Square; the *Portæ* ſtill remaining; it contains about five Acres. A Mile Eaſt of *Brighthelmſtone* on the top of a Hill, half a Mile from the Sea, is a Camp, which has a triple Ditch and Bank; this alſo is a Square, only the Corners are rounding; the outmoſt Trench meaſures about three Quarters of a Mile. In the Pariſh of *Telſcomb*, about five Miles Eaſt of the laſt, are two, but both imperfect; the Cliff is a South-Fence to one, the other is a Mile diſtant from it; their Weſt Sides are both finiſh'd with very able Works; they were deſign'd for Squares, and to contain 12 or 15 Acres. At *Meeching* or *Newhaven*, on the Point of the Hill, which overlooks the Harbour's Mouth from the Weſt, is a Fortification which they call *the Caſtle*; its Banks are very high, the Shape near half oval, containing about ſix Acres;

formerly it might be much more, becauſe the Cliff, which forms the Diameter, every Year more or leſs moulders away, and falls into the Sea. Near a Mile Eaſt of *Seaford* is another call'd alſo *the Caſtle*, bounded by the Cliff on the South; its Figure almoſt ſemicircular, the Trench and Rampart large, incloſing twelve Acres. Three Miles Eaſt of *Cukmere* Haven is the laſt, near a narrow Paſs coming up from the Sea call'd *Burling-gap*; it incloſeth a Hill nam'd *Belltout* of a half oval Shape; the Works have the ſame Figure, and meaſure about three Quarters of a Mile; the Cliff here alſo makes the Diameter.

Though neither Hiſtory nor Tradition has handed to us any Relation, when either of theſe Works were made or by whom us'd (except *Ciſsbury* by *Ciſſa)* yet from this View we may conceive, the Calamity of War once rag'd in all theſe Parts; that the Ground was diſputed Inch by Inch; that in the Attack, as well as Defence of it, the Pick-Axe and Spade were as much made uſe of as the Sword; and laſtly, that unleſs the Aggreſſors were very numerous, eight Years was no long time taken up, in diſpoſſeſſing the Inhabitants of this faſt Country.

Some may imagine, many of theſe Camps were made by the *Danes*; but by what may be obſerv'd from the Hiſtory of thoſe Times, that People ſeem'd not to be ſo formal an Enemy, as to prolong War by Encampments: Their Refuge was in their Fleets that always attended them; ſo that, when likely to be vigorouſly oppos'd, they betook themſelves to their Ships, and ſuddenly invaded another Part, where was leſs Oppoſition; and what they could not carry with them, conſum'd with Fire and Sword. Thus continually haraſſing the Nation by their haſty and rapacious Viſits, they exhauſted it of its riches and ſtrength, and as it were imitating the quality of the Faulcon their enſign, they ſlew the prey to a Stand, and then ſeiz'd it.

The Archdeacon of *Huntingdon*, in the Prologue or Dedication of his Annals, to *Alexander* Biſhop of *Lincoln*, aſſures his Dioceſan, that he compil'd his Hiſtory from Chronicles reſerv'd in ancient Libraries; no queſtion therefore, when ſpeaking of the *Saxons* here, he had good Authority to ſay (as above cited), *magis magiſque ſibi Regionis ſpatia capeſſentes*; and that no other meaning could belong to it; than that they carried their Conqueſt from Weſt to Eaſt, *in longinquum*, lengthways. Had they entirely made themſelves Maſters of the Country, 'twould have been too late: But before they had wholly gain'd it, the *Britons* aſſembled againſt them; the *Saxon* Chronicle ſays **neah**, i. e. *propè*; *Ethelwerd*, *juxta*; or, as *Huntingdon* has it, *apud* **Mercredesburne**; where a Battle was ſo hard fought, that each Side had enough on't, and retir'd. The *Saxons* were ſo diminiſh'd, that *Ella* was oblig'd to ſend for more Forces. This Action was in the ninth Year after *Ella*'s firſt footing here, three Years before *Hengiſt*'s Death, *Ann. Dom.* 485. It ſo weaken'd *Ella*, that we hear no more of him till he receiv'd his Supplies from *Germany*; which came not, according to *Henry Huntingdon*, till the firſt Year of the Emperor *Anaſtaſius*, three Years after *Hengiſt*'s Death, and ſix Years after the hard Battel, *viz. An. Dom.* 491.

Being thus ſtrengthned, *Ella* mov'd again, beſieg'd *Anderida* (in *Huntingdon*'s Words, *Urbem munitiſſimam*) at laſt forced the Place; and by reaſon of the ſtout Reſiſtance the Defendants made, Savage like, leſt not a Soul alive, and ras'd the City, which in *Huntingdon*'s Time remain'd deſolate.

As to the Field where the Battel was fought; the *Saxons* extending their Power Eaſtward, the Check that was given them, in all probability muſt have been where they puſh'd on their Victories; and it being near **Mercredesburne**, this *Bourne* near *Pevenſey* may be the Place meant, ſince it ſounds like the latter part of that Name (for there not being a *Weſt-Bourne* that it relates to, the Name of it may rather be *Esbourne* than *Eaſt-bourne*;) and likewiſe that *Anderida*, the *Britons* laſt Stake and Support, was not far from it. 'Tis probable therefore the Battel was fought on the *Downs*, between the Camp laſt mention'd at *Burling-Gap* and *Eaſt-Bourne*; for there are no where on the *Downs*, that I have ſeen (and there are few Parts of them that I have not often view'd) Marks of a greater Battel than there; becauſe, from the top of that very high Cliff, by the Inhabitants call'd *The Three Charles* (and by Mariners *Beachy-Head*) to *Willington Hill*, which is four Miles, the Ground is full of large *Tumuli* or Places of Burial; and in many parts within that Tract, where the Poſition of the Ground ſeems to offer, there are deep Trenches and Banks, which one would imagine were Breaſt-Works made to defend the Front of an Army; and the *Tumuli* on each ſide of them ſeem to ſhew, there was no ſmall Struggle, in forcing as well as defending them.

The Learned and Judicious Mr. *Somner* [g] diſlikes, that the Site of *Anderida* ſhould be fix'd at *Newenden*, and is inclin'd to aſſign ſome Place in *Suſſex* for it: But from a modeſt Deference to the Opinions of the Learned *Camden* and *Selden*, he drops the matter.

But let us ſee, what our more elder Hiſtorians ſay of it; *Henry* of *Huntington*'s Words are, *Et quia tot ibi damna toleraverunt Extranei, ita Urbem deſtruxerunt, quòd nunquam poſtea reædificata eſt. Locus tantum, quaſi nobiliſſimæ urbis, tranſeuntibus oſtenditur deſolatus.* *Matthew* of *Weſtminſter* ſays; *Locus autem Civitatis uſque hodie tranſeuntibus oſtenditur deſolatus. Manſit ergo ibidem* Ella *cum tribus Filiis ſuis, & Regionem illam, quæ uſque hodie Anglicè* **Suthſex**, *Latinè autem Regio Auſtralium Saxonum dicitur, colere cœpit.* From the Expreſſions above cited, it may be ſuppos'd the Ground where that City ſtood was not quite forgot, in either of thoſe Hiſtorians Days. *Henry* of *Huntingdon* being the elder by 200 Years (had *Newenden* been the Place), his Words might have been true, in ſaying it was deſolate: But 'tis very improbable *Matthew* of *Weſtminſter* ſhould have ſaid ſo likewiſe; or at leaſt, not taken notice of the Act of Piety and Charity of Sir *Thomas Alburger*, who, in his Time, had newly erected a Monaſtery at *Newenden* [h] for the *Carmelites* who came from *Palæſtine*: But let that paſs; what Authority Mr. *Camden* had for ſaying *Hengiſt* ſent for *Ella* out of *Germany*, to help him reduce

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[g] Somner's *Roman Ports and Forts in* Kent. p. 106.

[h] *Camd. Brit. Kent. Edit.* 1695. *Col.* 211.

Anderida, is not to be found. From the Accounts above ſtated, and others that might be produced, it is clear, that *Hengiſt* was dead Three Years before the Siege was laid to *Anderida*. In the Time of *Hengiſt*'s Life, we find, for Eight Years *Ella* had enough to do in *Suſſex*; and the Blow he had given him the ninth Year at **Mercredesburne**, oblig'd him to be quiet the other two Years of *Hengiſt*, and till his Succours (as above-mention'd) came to him from *Germany*. Beſides, we have not the leaſt Hint from any of our Hiſtorians, that *Anderida* was an Eye-ſore, either to *Hengiſt* or his Son *Esk* after him; or that *Ella* aſſiſted the *Kentiſh Saxons*, or the *Kentiſh Saxons Ella* in reducing it: Therefore this muſt be a Suppoſition only of Mr. *Camden*, in order to give Strength to the Notion of *Anderida*'s being at *Newenden*. Taking no notice therefore of that Suppoſition, we may conſider *Newenden* is on the *Kent* ſide of the *Limen* (for ſo is the River *Rother* call'd [h] in the *Saxon* Annals, and by *Matthew Weſtminſter*, and the Mouth of it nam'd *Portus Limeneus*, and **Limene** by *Ethelwerd* [i] and *Henr. Huntindon*;) and that *Kent* having been ſubdued by *Hengiſt* and his *Saxons*, near forty Years before; the Town at the Mouth of the *Limen*, and the reſt, if any, up the Stream on the ſide of *Kent*, were alſo part of their Conqueſt.

Furthermore, after it had coſt *Ella* ſo much Time, and no doubt Pains too, in reducing the plain Ground of *Suſſex*, 'tis not likely he ſhould call more Forces out of *Germany*, that he might lead them thirty Miles, through the Difficulties of the great Wood (which he muſt have done if *Newenden* were the Place,) to beſiege a City, ſo far from his own, and within the *Kentiſh-Saxon* Limits, eſpecially if there's any heed to be given to the Words of *Math. Weſtminſter* before cited; who, after relating the ſad Fate of the Inhabitants and City of *Anderida*, immediately ſubjoins, *Manſit ergo, &c.* Ella *and his Sons reſided there* (*i. e.* in that part of *Suſſex* where *Anderida* was,) *and began to cultivate and improve the Country.*

In the laſt place, from the Uſe of *Anderida* by the *Romans*, 'tis not likely (as Mr. *Somner* [k] judiciouſly hints) its Place was at *Newenden*; for being one of the Stations, under the *Præfectus littoris Saxonici*, where Forces were quarter'd, to have a watchful Eye on the Sea, when ever the *Saxon* Pirates came to infeſt the Coaſt: We may ſuppoſe it, like the reſt of the Garriſons under that Officer, conveniently ſituated for the ſame purpoſe, as were *Branodunum* [l] *Brancaſter* at the North Point of *Norfolk*; *Gariannonum*, North-*Yarmouth* or very near it; *Othona*, *Ithancheſter* in *Dengy* Hundred, in *Eſſex*, ſome Ages ſince ſwallowed up by the Sea; *Regulbium*, *Reculver* in *Kent*; *Rutupis*, *Richborow*; *Dubris*, *Dover*; *Lemannis* (which from the *Saxon* Chronicle [m] we muſt look for, four Miles Eaſt of *Appledore*) probably New *Romney*, all ſituate near the Sea, on Ground which had a full Proſpect of the Sea: whereas *Newenden* lies low, at leaſt eight

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[h] Chron. Sax. A. Dom. DCCCXCIII. Mat. Weſtm. Fl. Hiſt. A. Dom. DCCCXCII.

[i] Ethelwerd. Lib. III. cap. iii. A. Dom. DCCCXCIII. Hen. Hunt. Hiſt. lib. V. Alfr. Reg. an. 19.

[k] Somner Rom. *Ports and Forts*, pag. 103.

[l] Not. Imperii à Pancirol. cap. lxxiii. pag. 162.

[m] Chron. Sax. A. Dom. DCCCXCIII.

Miles within *Appledore*, on a turning of the River, where the Land Eaſtward muſt have cut off any Proſpect of the Sea. To all this may be added, that the *Romans* having a *Numerus*, Cohort, or Battalion of the *Turnacenſes*, in Gariſon at the *Portus Lemanis* on the Mouth of the Haven, we may ſuppoſe they knew how to husband their Strength to better purpoſe, than to place another Gariſon to watch the Motions of the *Saxon* Rovers, twelve Miles up the little River, quite out of ſight of the Sea, where they could be of no Service.

Thoſe who would have the Seat of *Anderida* to have been at *Haſtings*; let them look on theſe Words of *Henr. Huntindon* [n] (*Haraldus rex Anglorum, eadem die reverſus ad* **Eouerwic** *cum ſumma lætitia, dum pranderet, audivit nuntium dicentem ſibi, Willielmus dux Normanniæ littora Auſtralia occupavit, & caſtellum conſtruxit apud* **Haſtings**,) and they will conclude *Haſtings* was not a deſolate Place, in the Ages of the Hiſtorians, who affirm *Anderida* was: If at *Pevenſey*; that Place was ſo far from being raz'd by *Ella*, that even after the *Norman* Conqueſt it remain'd a ſtrong Caſtle, where *Odo*, Biſhop of *Bayon* and his Forces ſuſtain'd a Six Weeks Siege; and for want of Proviſion were oblig'd to ſurrender to K. *William* II. At this time there is ſo much of *Pevenſey* ſtanding, that perhaps 'tis the greateſt and moſt entire Remain of *Roman* Building, any where to be ſeen in *Great Britain*.

From the Arguments on the foregoing Authorities, *Anderida* muſt have been ſomewhere in *Suſſex*, not in the Weſt but Eaſt part of it, and not far from the Eaſt End of the *Downs*, near the Sea. From the Bath, Pavement, Coins, and Bricks, 'tis ſure the *Romans* had once an Abode, and not a ſhort one, at this Place near *Eaſt-Bourne*: From the large Extent of Foundations about the Place where theſe were diſcover'd; that there was a large Town or City there: From the common Height thoſe Foundations bare under the Surface of the Ground; that the Buildings they ſuſtain'd were effectually levell'd or raz'd: And from the Coals dug up amongſt the Rubbiſh, 'tis evident that Part was burnt; all which Circumſtances well enough agree with the Account given us of *Anderida*.

The Situation likewiſe of a Town here, gives reaſon enough to ſuppoſe, it was a Place of Importance, and whence it had its Name; no Part hereabouts being any way ſo convenient, for a ſecure Settlement; or for ſuch a uſe as the *Romans* might have occaſion to make of it. We are inform'd by *Cæſar*, that the Maritime Parts of *Britain* (ſpeaking of what he ſaw, which was the South-Eaſt) were inhabited by People from *Belgium*; and [o] that they call'd their Settlements by the Name of the Places from whence they came. It was the Opinion of *Tacitus* alſo, that [p] thoſe who inhabited next to *Gaule*, came from *Gaule*. And *Bede* ſays, the Tradition in his Time was, that the Southern Part of the Iſle was peopled [q] from *Bretaign*. In the Third and Seventh Books of *Cæſar*'s Commentaries, mention is made of the *Andes*, a City and a People belonging to it among the *Celtæ*, inhabiting on the Sea-Coaſt. Time varying Names of Things, near Two Hundred Years after *Cæſar*, *Ptolemy* calls the City *Anderidum:* And near 250 Years after him, when the *Notitia Imperii*, now extant, was in uſe, the *Claſſis Anderetianorum* [r] is regiſter'd; and the Reſidence of their Admiral fix'd at *Paris*. From whence 'tis to be inferr'd, that tho' the Capital of the *Andes* might have been *Angers* near the *Loyre*, yet their Country had on the North the *Britiſh* Chanel; and on the Eaſt the *Seine* for its Bounds. The *Britiſh* Coaſt about *Eaſt Bourne* is the neareſt of any to the Mouth of the *Seine:* Therefore, according to the Uſage before *Cæſar*'s Time, the Name of *Anderida* there, is readily accounted for. Moreover, this Place ſeems moſt naturally ſeated, for giving an Appellation to the great Wood, to which it adjoin'd: For, as it ſelf is on the Shoar; ſo alſo the *Sylva Anderida* here came very near the Shoar; and a large part of it might be ſeen from the Sea before it: Indeed, on the Sea off of *Romney*, it might be diſcover'd; but then the Diſtance was great: At all other parts of the Coaſt, the Sight of it from Sea is hinder'd by Hills, or high Cliffs.

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[n] *Henr. Huntindon*, Hiſt. lib. vi. [o] De Bell. Gall. lib. v. [p] Tac. Agric. cap. xi. [q] Bedæ Hiſt. Eccleſ. Gent. Angl. lib. I, cap. 1.

Setting aſide the want of a navigable River, the Spot of Ground where this old Town ſtood, yields to none in the County for Importance and Pleaſure: For here, like a Wedge, ends the firm Soil of the *Downs*; Nature has ſhap'd it like an Equilateral Triangle, having each ſide half a Mile in Length: Towards the Sea, on the Southern ſide, 'tis fenc'd by a low Cliff, of 12, 15, and in ſome Places 20 Foot high (in which Cliff is now to be ſeen a ſtrong Foundation, that has acute Angles, which ſhews it to have been for a Fort rather than a Dwelling-Houſe.) On the Northern ſide is a Moraſs, with a large Rivulet of very good Water. Between the Weſt ſide and the *Downs* lies a ſmall Valley, by which Advantage, there was formerly a Harbour, capable of a ſmall Fleet; the Banks on each ſide of it are an Evidence it was ſunk by Induſtry; but by Weeds and Gravel from the Sea, and by Mould annually added, as is obſervable [s] in Valleys, it is now ſo rais'd, that 'tis never flow'd but at high Spring-Tydes, when a ſtrong Wind forceth the Waves into it. This Harbour muſt have been a good Security to part of the Weſt ſide; what other Works might have been to guard it, from the end of the Harbour to the Moraſs, cannot be ſaid; by reaſon the Ground between has for many Ages been in Tillage. It is eaſy to imagine of what Importance a Town fortified as this Place muſt have been in thoſe Ages, when the only Paſs by Land from the Weſt to the Eaſt End of the County was through it; for other there could not be, in many Miles North; unleſs the Lands in that Tract, which are ſtill very owzy and tender, had been well drain'd.

As the Situation deſcrib'd render'd this Place ſtrong, it is very pleaſant withal; for the Ground is high enough for a good Proſpect of the Low Lands adjoining, and the Country towards *Battell*; beſides, it has a commanding view over that Bay, which is between *Beachy-Head* and *Haſtings*. If the Uſe made of it by the *Romans* was to guard the Coaſt, there was this Advantage belonging to it; that a Centinel on the top of *Beachy*, not Two Miles from it, in a clear Day, without turning his Body, might ſee the *Iſle of Wight*, the Hills in *France* near *Bologn*, and the *Neſs* in *Kent*; ſo that from the *Neſs* to *Selſey*, it muſt have been a ſmall Sail that could eſcape his Eye.

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[r] Pancirol. Comm. in Notit. Imp. Cap. xc. pag. 179, 180.

[s] Philoſ. Tranſact. An. 1701. N° 274. Pag. 926.

Urns in Norfolk, *communicated by* Peter le Neve, *Eſq; n.* 337. *p.* 257.

XXI. In the Pariſh of *Elmham*, about half a Mile from the Town (or better) there is a Cloſe called the *Broom-cloſe*, lying on the Weſt-ſide of the Road from *Elmham* to *Beetly*, and belongs to Mr. *Harvey* of *Buckenham*. About *Candlemaſs* laſt ſome Labourers accidentally pitch'd upon a Pot, in which finding nothing but Duſt and Aſhes, they went to their Work again, and digging on found two or three more, but the Contents the ſame. When they came home at Night, they publiſh'd what they had found, and in a little time were inform'd that they were Urns: The Report of which put ſome Perſons of more Curioſity upon a further Search; and digging firſt under the Hedge, and afterward further into the Cloſe, found great quantities of them, and ſeveral very near together. There is one Man in the Pariſh who has been chiefly employed in this Search for ſeveral People, and the Number that has been taken up ſince the firſt Diſcovery, falls ſhort very little of 120. and yet the compaſs of Ground turn'd up on this Occaſion does not amount to more than a Rood of Land (*i. e.* one quarter of an Acre.) The Cloſe where they are found is high Land, and this Place the higheſt part of it; the Soil a ſharp Gravel, and very dry, and lies next to a Highway. As for the Urns themſelves, they are generally of the ſame Shape, but of very different Sizes. The Shape of theſe is conformable to the Repreſentations uſually exhibited in the Deſcriptions of Urns; *viz.* the Bottom narrow, a little flatted (and in ſome quite round) wider upward; the Top contracted to a narrow Mouth: The Earth coarſe, the Work rough and uneven, but generally well burnt: ſome of them ſlightly wrought and indented (the Work expreſſes very little Skill or Care) and ſome plain, of which laſt ſort I have one perfectly entire (not yet open'd.) The Size is various; ſome of the Capacity of a Quart, ſome two, ſome three Quarts, and one I have (unopen'd yet) that I believe will contain a Gallon.

The Pots are very tender when they come firſt out of the Ground, and frequently ſuffer by the Wounds of the Spade: They are moſt of them broken (more or leſs) in taking them up, and hardly any that have not their Mouths broken; of which many of them ſeem to be done, as they lie in the Ground, by the weight of the Earth preſſing upon them, or the Feet of Horſes going over them, as appears by the broken pieces of ſeveral of them found a good way down among the Earth. The Urns are found at uncertain Depths; ſome very near the Surface, ſome two, ſome three Spits deep, which is the deepeſt any Body has taken Pains to dig hitherto.

As for the Contents (by what I can hear) they are generally the ſame. I have open'd ſeveral of them, and found in all of them plenty of pieces of broken Bones, ſome Black with burning, and ſome turn'd to Aſhes, with ſome pieces of coarſe Glaſs run and ſticking to the Bones; which whether it proceeded from any thing of that kind burnt with the Body, or only the ſandy Earth vitrified with the ſtrength of the Fire (as I am inclined to think) is doubtful. Beſides, I found ſome pieces of Braſs, ſome run, ſome much burnt, and ſome not injur'd, with ſome pieces of Iron, but ſo decay'd with ruſt, that their Figure or Uſe is hard to judge of. I have ſome Knives and other odd things, but much eaten and decay'd with Ruſt: But the Braſs, which is not burnt to pieces, remains generally firm and entire. One thing is remarkable, we find a great many pair of ſmall Nippers (ſuch as we pull out Hairs with) commonly of Braſs; and moſt of them ſo perfect and good, that the Edges are full ſquare, and the Spring as ſtrong as any we can make of the Metal. Theſe are chiefly the particulars of what we find: But as for Coins we meet with none. I hear of two in the Hands of a Perſon of *Elmham*, but had not an opportunity of examining them: But when they were found or taken up I can't tell. I have one found t'other Day in an Urn, but very imperfect; what remains of the Impreſſion looks more like *Britiſh* than *Roman*; but by the ſhape of the Coin and Mettle it ſhould be the latter, tho' I think not eaſie to determine.

Two of theſe Urns, of different ſizes, with pieces of Bones, Aſhes, Teeth, and part of an old Braſs Inſtrument (ſuppoſed to have been a *Roman Fibula*) contained in them, are in the *Royal Society's* Repoſitory.

Urns and Sepulchral Monuments found in Ireland, *by* Fra. Nevill, *Eſq; n.* 337. *p.* 252.

XXII. At *Caſtledoe*, I met a Man who had found an Urn within a Mile of that Place. He carried me into a little Iſland, ſurrounded with Bogs where his Cabin ſtood. The Iſland was very dry, light, ſandy Ground, which he had plow'd: The Plough running in ſome places over flat Stone, cover'd above with Earth, made the Man curious to ſearch: In taking up the Stone he found a Cavity under it, which I believe may be call'd a Sepulcher, or Tomb: In it he found an Urn, which he broke, becauſe nothing was in it but Bones and Aſhes. In the ſame Tomb there were ſome Bones of one about ten or twelve Years old. The Tomb ſtood Eaſt and Weſt, the Urn was found in the Weſt end; it was the ſmalleſt Urn I have ſeen, but the Cavity wherein it lay was near five Foot long, two Foot and a half broad, and about the ſame depth: It was made up of ſix coarſe flag Stones, *viz.* one on each ſide, one at the Head, another at the Foot, one above and one below: The Bones were much waſted, and but few of them. Whilſt I ſtaid there, we opened three more, which the Man quickly found out, becauſe he had made his Marks by the Plough. Theſe three were much larger than the former; one of the three was near the Center of the Iſland, and biggeſt of all; but all alike made. There was no Urn in either of them, and but Bones in one, which was the biggeſt. The Bones ſeem'd to be of a Man of an ordinary Stature: If there had been any in the other two they were conſumed. This ſeem'd to be a common Burying Place, there being ſo many of that kind of Tombs in it; and one may gather from thence, that at that time they burnt ſome, and others they did not; becauſe here was an Urn found with Bones burnt, and there were Bones unburnt. This Iſland is ſituate on an *Iſthmus* about half a Mile over, between the Bay of *Dunfannaghan* and the Logh of *Kinnevier*, near to Lieutenant General *Hamilton*'s Houſe.

There were three the like Urns found in three ſmall Stone Cheſts, under a great Kern, or heap of Stones, near to *Ban* Bridge in the County of *Downe*; which heap being removed to help to build that Bridge, they were diſcover'd. There were the like Urns found near *Omagh* in the County of *Tyrone*, in the like Cheſts, under two heaps of Stones, which were removed to build ſome Houſes in the ſaid Town. There was one Urn found in a little ſandy Hill near *Cookſton* on the Road to *Liſſon* in the County of *Tyrone:* It was covered with a great rude Lime-Stone; which being removed in order to make Lime, the Urn was diſcovered in a Hole encompaſs'd with ſix Stones of equal bigneſs, which made a Hexagon, in which the Urn ſtood. The Water that had fallen on the Urn from the Lime-Stone, or the Air condenſing, had petrified, and made a ſtony Cruſt on the outſide thereof. There were ſome Bones and Aſhes found in it. Sir *Robert Staples* had the Urn and gave it to me, which I deſigned for the College; but the Fellow I intruſted to carry it broke the ſame, and ſo my deſign fail'd.

At *Dungannon* in the ſame County, a Servant of mine working in a Sand-Pit near the Town, ſtruck on an Urn, which was the largeſt I ever ſaw. It was found with the Mouth whelm'd downward, the Bones and Aſhes on a flat Stone, and the Urn covering them: It would have held about three Quarts, and had been better burnt in the Fire than they uſually are: But this met with the Fate of others; it was broke by the Spade before the Man was aware, and had no Stones about it as the others; but was bury'd in the Earth about a Foot under Ground. As they dug the Bank for Sand, the Place where the Carcaſs was burnt was diſcovered by the Coals and pieces of Bones, which ſpread a great way, about a Foot under Ground.

Near to the ſame Town, in a Town-land call'd *Killimeille* (which in *Engliſh* is Lowſey Cell, or Lowſey Burying-Place) there are on the top of the Hill two Circles of dry Stone about 20 Yards in Diameter each; they meet on two ſides and make the Figure of Eight. I ſuppoſe when firſt form'd they made a dry Wall for two diſtinct Burying-Places, one for the Men, the other for the Women; or rather two Repoſitories for Urns. One *James Hamilton*, who farm'd the Ground from Mr. *Knox*, wanting Stones to build a Houſe, drew off moſt of them from this Place. When he had enter'd within one of the Circles, he found three Urns in three ſeveral Holes, ſet about with ſix Stones, and cover'd with flat Stones, and other Stones thrown on the Top; he broke what he found, not finding what he expected. Mr *Knox* and I went there to ſee the Place, and ſaw the Holes and broken Urns; but the Man's Houſe being finiſh'd there were no more found; but I am perſuaded there are many more, becauſe theſe three were found near together. The Poor Man met with an Accident of Fire in his Malt-Houſe, which did him great Damage; the *Iriſh* attributed it to his taking thoſe

Stones to build his Houſe, which they call'd Holy, tho they knew nothing of its being a Burying Place till thus diſcover'd. On the ſame Hill about thirty Yards diſtance to the Eaſtward of theſe Circles, upon ſearch we found the Altar whereon they uſed to burn the Dead, over-grown with Earth and green Sod, which we cauſed to be uncovered: It was made of dry Stone, eight Foot long and four Foot broad, the Coals and Bones freſh among the Stones, and the Stones burnt with Fire. At the Eaſt end of this Altar there was a Pit, which was likewiſe over-grown with Earth and green Sod; which we open'd, and found it to be the Receiver, where they ſwept in all that remain'd on the Altar after Burning. We ſearch'd deep, and the ſubſtance was all alike, black and greaſy: It had tinged the Hill in a ſtrait Line from the Pit to the bottom of the Hill; and diſcover'd it ſelf to our View, the Land being then plough'd.

In the County of *Farmannagh*, upon a Hill over *Wattle-Bridge*, there has been a mighty Heap of Stones, the Baſis incircled with very large Stones ſtanding on end. This Heap has been removed to pave our Ways, and build that Bridge; under which there were ſome Urns found in Stone-Coffins, and I believe there are ſome remaining. Theſe were, I ſuppoſe, the Urns of ſome great Perſonages. The Heap was ſo big, and the Stones about it ſo large and ſo many, that it coſt great Pains to bring them there: Or perhaps there might have been a Fight there, and ſome of the great Officers might have their Bones interr'd there, and the Army made that great Work over them; for it ſeem'd to be a Work done by many. I have ſeen ſeveral ſuch Heaps in this Kingdom, and I doubt not but they are all Monuments for the Dead.

Ancient Trumpets, &c. *found in* Ireland, *by the ſame. ib. p.* 270. *Plate* 8. *B.*

XXIII. There were 8 Trumpets, 4 of one Make, and 4 of another, found in the lower Barony of Dungannon, about 7 Years ago. Two I have now by me, repreſented in Fig. 4. and 5. They are of caſt Braſs, about the Thickneſs of an *Engliſh* Half-Crown.

Fig. 4. is 24 Inches long, according to the Turn or Arch it makes, and is 3 Inches in Diameter at the large end, and at the ſmall end it is ſolid for about 2 Inches, with a Loop at top to hang it by, and another Loop between the ſolid part and the Mouth-piece. The Mouth-piece is oval 5 Inches from the ſolid end, 1 Inch and $\frac{3}{4}$ long, and 1 Inch wide: The Sides are ſmooth, round, and even, eaſy for the Lips of a Man, but will not admit of any Sound by Blaſt as a Horn doth, but by the articulate Voice of tooting it will: One may raiſe his Voice in it to the higheſt Pitch, and bring it to the deepeſt Baſe.

Fig. 5. is 26 Inches long, one Inch wide at the ſmall end, and three Inches at the other; but ſeems to be imperfect for want of a Mouth-piece; the ſmall end ſeems to be fitted to receive one. On the Back at *a*, there is a Hole, and another under the Moulding at *b*; the firſt I believe was to faſten the Mouth-piece, the ſecond I imagine was to ſtop or open with the Finger to alter the Sound at pleaſure. But as it is now, it cannot be ſounded; for it is no way fitted for the Mouth, it being thin and ſharp.

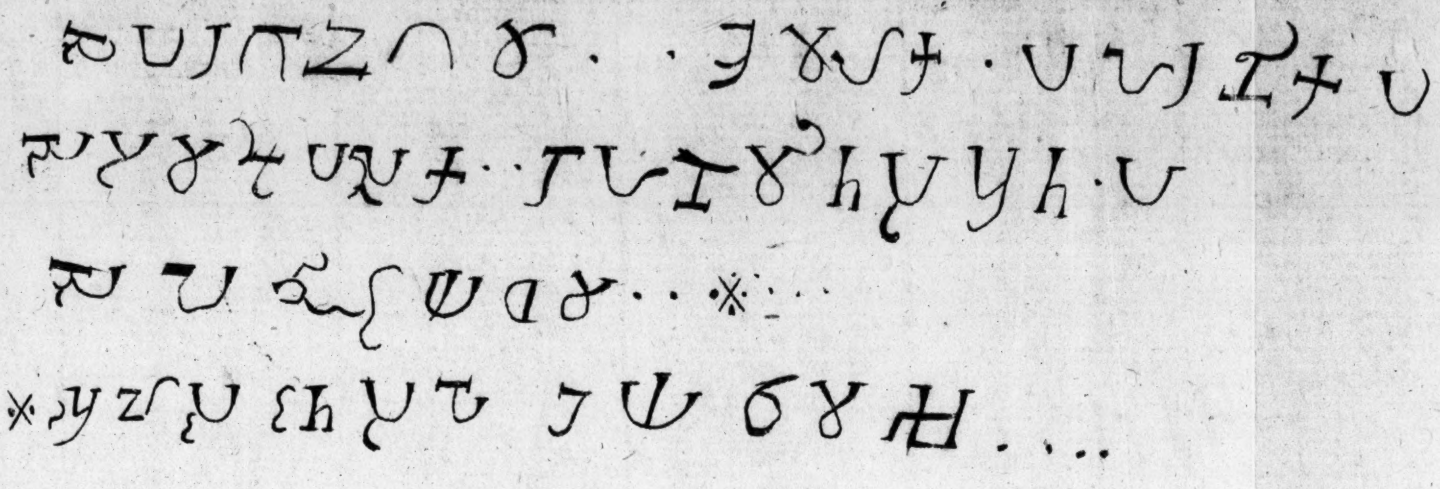


Fig. 2.

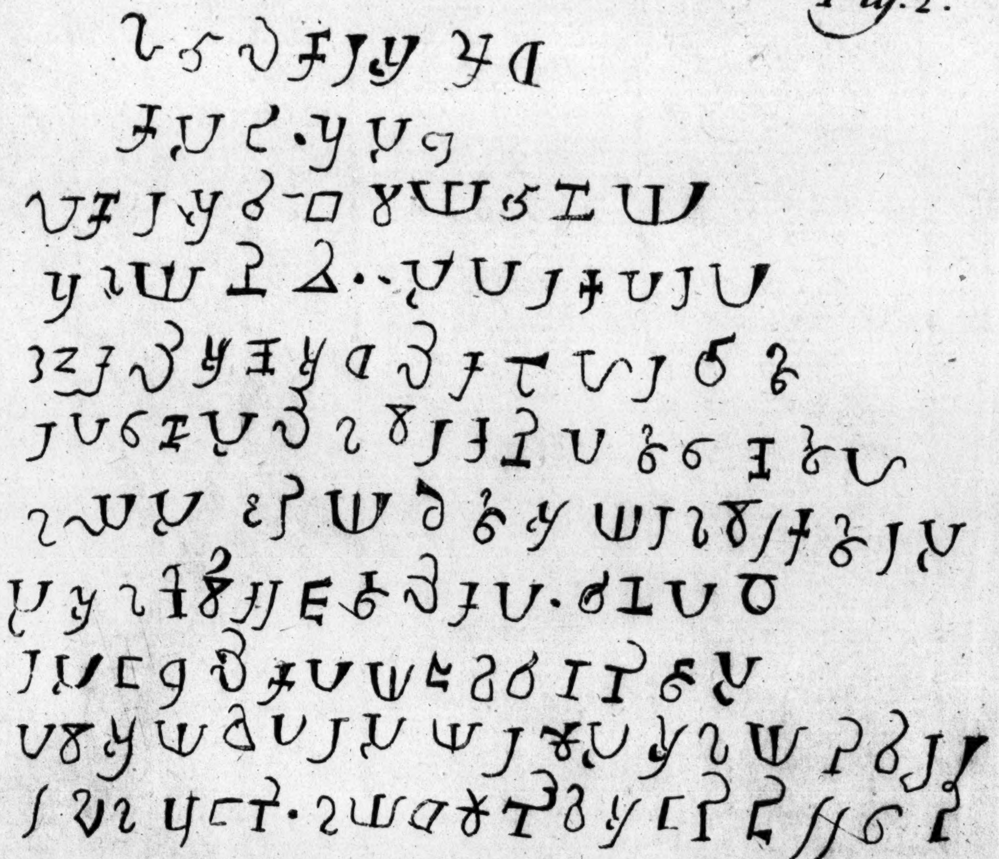
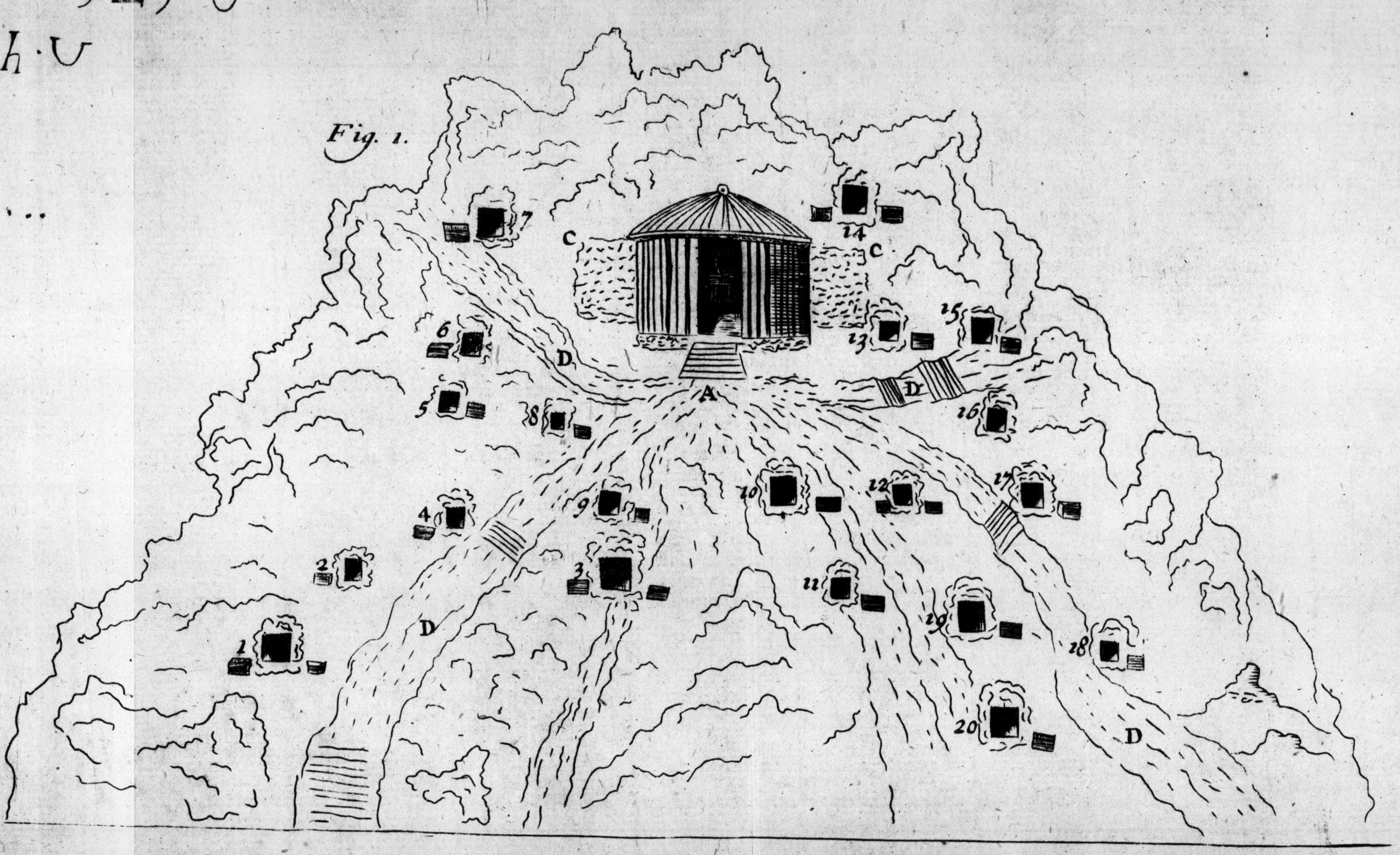


Fig. 1.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I cannot find in any *Iriſh* Story, or by Tradition, any Account of this ſort of Trumpets, nor indeed of any other; from whence I gather they are of great Antiquity: For had they been of uſe at, or ſince the firſt of the *Engliſh* Conqueſts, there would have been ſome hints of them. And therefore I do conclude they were of uſe when the Country was Pagan, and not in Martial Affairs, but by their Prieſts at their Funeral Rites when they buried their Dead, and bore a part with thoſe who cry'd at thoſe Funerals, or made an howling ſort of a Noiſe; which ſort of Noiſe is uſed among the Natives to this Day.

Fig. 6. is an Inſtrument of much better Metal, being fine Gold; but what to call it, or of what uſe, I never could meet with any could tell me. There have been 5 found in different places, three of which I have ſeen ſince I came to this Place. One was found near *Coot-hill*, in ſcowring a Ditch, under the ſide of a large Stone; which Stone was one of three which were placed triangular-wiſe; whether ſet in this form as a Mark to find this thing when hid, or whether for any other uſe, I cannot gueſs; but I have ſeen Stones in ſeveral Parts of this Kingdom ſet in this Order. It is reported, that there were ſome other pieces of Gold found with this, but I could not ſee them: One, I was told, was ſomewhat like a Scepter, about eighteen Inches long; and another was round like a large Medal, as thick as two Crown Pieces, and as broad as the Palm of a Man's Hand, with ſtrange Characters on it. But whatever they were, the poor Man that found them I believe got but little by them; for this, of which I have here ſent the Draught, was ſold at the Market of *Coothill* for a quarter of a Pound of Tobacco, and afterwards at *Dublin* for 23 Pounds, where I ſaw it at the Goldſmiths. Its Beauty and Colour ſurpaſſed any Gold I had ſeen: It had been caſt, and not wrought with the Hammer. The two Cones were two Inches in Diameter each, and two Inches aſunder from each other. The Bow or Handle was made like an Arch (as you ſee in the Figure) about a quarter of an Inch thick: The Handle was round, tapering towards both ends, where it was fixed to both the Cones. The Goldſmith told me, that when he had wrought part thereof, he could not bring the Gold to the right Colour again, tho' it was in fineneſs equal to our Standard.

The Figures of a Pagan Temple and unknown Characters at Cannara *in* Salſet. *n.* 321. *p.* 372, *by Mr.* Alex. Stuart. *Plate* 9.

XXIV. Fig. 1. The rocky Mountain *Cannara* in the Iſland of *Salſet* belonging to the *Portugueſe*, with the Temple and Caverns.

A. The Temple and ſacrificing Place, like the Choir of a Church, arch'd and ſupported by 45 Pillars, all cut out of the Rock.

B. The Altar in the furthermoſt end of it, alſo cut out of the Rock; with a narrow Canal about the Foot of it, I ſuppoſe deſign'd to be fill'd with Water.

C C. The unknown Characters engraven on the Rock on each ſide of the ſquare Entry, repreſented in Fig. 2.

D D D, *&c.* The various irregular Paths of Aſcent, ſome cut out in Steps, as Stairs.

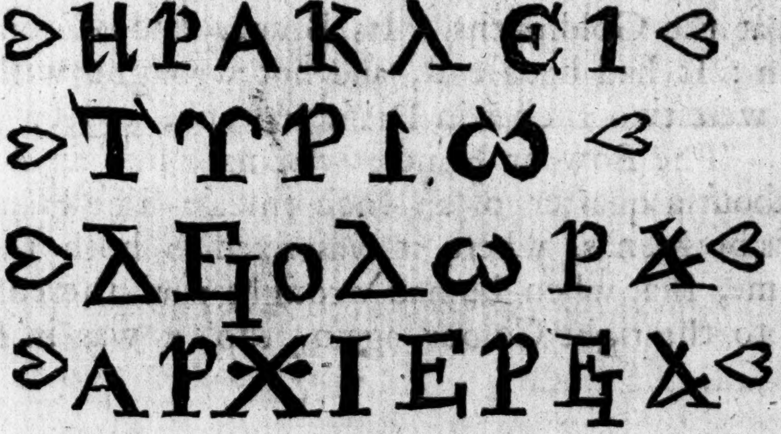
1 2 3, *&c.* The various Caverns, moſtly of a ſquare Figure, ſome large, others ſmaller; cut out of the Rock, whoſe Roofs are cut plain, like a plaiſter'd Room: At the Door of each without is a large Ciſtern or two, cut out of the Rock, full of Rain-water; at leaſt I could not perceive them to be Springs.

On the Sides of the Doors of ſome of the Caverns are Characters like thoſe of the Temple.

Fig. 2. Characters engraven on each ſide of the Door or Entry of the Pagan Temple of *Cannara.* See *Phil. Tranſ. n.* 201. *Abr. vol.* 3. *p.* 526.

Teeth and Bones in Northumberland, *by Dr.* Todd. n. 330. p. 291.

XXV. The Place where the Bones were found is *Colcheſter*, a Mile Weſt of *Corbridge*, upon the North Banks of the River *Tyne:* formerly a *Roman* Colony; but, at preſent, a Field of Corn; nothing of Antiquity remaining, but ſome Walls and Rubbiſh; which ſhew it to have been a very large Fortreſs. Stones, which have been dug up, with Figures and Inſcriptions upon them, have been all remov'd to *Corbridge*, which has riſen out of its Ruins. There, I ſaw Altars inſcrib'd; One IMP. M. AVRELIO... Another LEG. II. AUG. COH. IIII. But that which is moſt remarkable is that which ſtands in a corner of the Church-yard, Dedicated to *Hercules*, in Old Capital, *Greek* Characters; the like to which, is not to be met with, I think, in any other Part of this Iſland. The Characters are indifferent plain; and, as I could read them, thus;


ΗΡΑΚΛЄΙ
ΤΥΡΙ.ω
ΔΕΟΔωΡΑ
ΑΡΧΙΕΡΕΑ

i. e. *Herculi Tyrio Divina Dona, Archi-Sacerdotalia*, vel, *per Summum Sacerdotem offerenda.* The Altar ſeems to have been erected by ſome of the *Aſiatick Phœnician* Auxiliaries; who might be in Garriſon here, near the Frontier, under *Urbicus Lollius*, in the Time of *M. Aur. Antoninus*, about *A. D.* 140. The Altar is very large; hollow at the Top, (as uſual) for Incenſe: On the Sides, are ingrav'd a Bull's Head; with Garlands, and Sacrificing Inſtruments.

The Teeth and Bones, which were diſcover'd, by the River *Tine*'s breaking in upon the Bank, were found near the Foundations of the Old Fort;

and neither higher up, nor lower down, than the Ruins of it ſeem to reach. I examin'd the Perſon who made the firſt Diſcovery; and had Money for preſenting ſome of the Bones, from ſome Gentlemen in the Neighbourhood, and I was as exact, as poſſible, in the Remarks, which I made my ſelf upon the Spot. Upon the whole, it appear'd to me: That there never was an entire Sceleton found in that Place.

The Teeth and Bones, lie in the Bank, in *Strata*'s; ſometimes at one, ſometimes at two Yards depth, for above 200 Yards in length. In ſome places, there appears to have been a ſort of Pavement or Foundation of Stone; which runs along with the Bones, *ſtratum ſuper ſtratum*; ſometimes above, ſometimes below them. The Bones are of different Sizes: The Teeth, which are moſt perfect and entire, are very large; ſome three or four Inches in compaſs: Ribs, Shank-Bones, *&c.* (many of them) not exceeding the ordinary Dimenſions of thoſe of Sheep and Oxen. I could meet with no Remains of Horns; thoſe being more eaſily corrupted, than the Bones, which are of a harder Subſtance. The Teeth look as if they were humane; but I cannot affirm them to be ſo: And they lie, ſometimes, at ſo great a diſtance from the Ribs and Shank-Bones; that ſhould any one take the pains to compute the Length of the Monſter, from one to the other, they might calculate his Longitude, to 200 or 300 Yards, as reaſonably, as to 22 Foot. The Teeth and Bones are in ſuch Quantities; that, with the help of a Labourer or two, you might in a few Hours, gather a Buſhel of them.

From the Account I have given, it may not be unreaſonable to infer: That the Altar, here Dedicated to the *Tyrian Hercules*, was very famous and much frequented: That, Oxen, and ſuch like Creatures, as Biſons and Bonaſſus, (with which the Country hereabouts did anciently abound: The entire Head and Horns of one, being lately dug up, in a marſhy Ground; reſembling exactly thoſe Creatures, as they are deſcrib'd by *Geſner*, and others,) were ſacrificed thereon: And, that their Bones being all thrown together; and, according to the Superſtition of thoſe Times, laid under the Foundation and Pavement of the Fort, are the very ſame Bones, Teeth, Skulls, Ribs, *&c.* which, by the Rivers waſhing away the Bank, are now diſcover'd, and brought to Light. And, if I might be allow'd to gueſs a little farther; I might think it not impoſſible, that (as *Erkelens* in *Gelderland*, is *Herculis Caſtra*; and *Hertland* in *Cornwall* was *Herculis Promontorium*, ſo) upon the Receſs of the *Romans*, the *Saxons* who ſucceeded them might call this noted Station *Hercul ceaſter*, and by corruption, *Colceaſter*; or *Colcheſter*, its modern Name. And, what may ſomewhat confirm the Conjecture, the adjacent Town of *Corbridge*, which, as I ſaid, has riſen out of its Ruins, is called in the Charter of *H.* 1. (whereby that King gave it to the Secular Canons of *Carliſle*, before the Erection, either of the Priory or Biſhoprick,) *Colbruge*, and *Colburgh*, the ſame as *Col-ceaſter*: The Bridge, from whence it may ſeem to take its Denomination, being of a much later Erection. That Oxen uſed to be Sacrificed to *Hercules*, there needs no other

Evidence, than the Altar itſelf; whereon an Ox's Head, with Sacrificing Inſtruments, are delineated.

Large Teeth in the North of Ireland, *by* Fra. Nevile, *Eſq; n.* 346. *p.* 367.

XXVI. 1. There are in all four Teeth, two of a larger, and two of a ſmaller ſort, the largeſt is the fartheſt Tooth in the under Jaw, the other is like it and belongs to the oppoſite Side; the leſſer Tooth I take to be the third or fourth Tooth from it, and has its Fellow; theſe are all that were found, and one of them in a Piece of the Jawbone, which fell to dirt as ſoon as taken out of the Earth; there was part of the Scull found alſo of a very large Size and Thickneſs, but as ſoon as expoſed to the Air, that mouldered away as the Jaw had done. By thoſe Bits of Bones that were found, one might gueſs that they were Parts of thoſe that were of a larger Size. The Place where this Monſter lay was thus prepared, which makes me believe it had been buried, or that it had lain there ſince the Deluge. It was about four Foot under Ground, with a little Riſing above the Superficies of the Earth, which was a Plain under the Foot of a Hill, and about 30 Yards from the Brook or thereabouts. The Bed whereon it lay had been laid with Fern, with that ſort of Ruſhes here call'd *Sprits*, and with Buſhes intermixed. Under this was a ſtiff blew Clay on which the Teeth and Bones were found: Above this was firſt a Mixture of yellow Clay and Sand much of the ſame Colour; under that a fine white ſandy Clay which was next to the Bed: the Bed was for the moſt part a Foot thick, and in ſome Places thicker, with a Moiſture clear through it; it lay ſad and cloſe and cut much like Turf, and would divide into Flakes, thicker or thinner as you would; and in every Layer the Seed of the Ruſhes was freſh as if new pull'd, ſo that it was in the Height of Seed-time that thoſe Bones were lay'd there. The Branches of the Fern, in every Lay as we open'd them, were very diſtinguiſhable, as were the Seeds of the Ruſhes, and the Tops of Boughs. The whole Matter ſmelt very ſower as it was dug, and tracing it I found it 34 Foot long, and about 20 or 22 Foot broad.

It will be well worth conſideration what ſort of a Creature this might be, whether Human or Animal; if Human, there was ſome reaſon for the Interment, and for that Preparation of the Bed it was laid on; if Animal, it was not worth the Trouble: if Human, it muſt be larger than any Giant we read of; if Animal, it could be no other than an Elephant, and we do not find that thoſe Creatures were ever the Product of this Climate. And conſidering how long this muſt have lain here, I do not believe the Inhabitants then had any Curioſity or Conveniency to bring ſuch into this Kingdom; for I ſuppoſe the beſt of their Ships could not carry one. Then if an Elephant, or ſome other Beaſt which muſt have proportion to the Teeth, it muſt have lain there ever ſince the Flood; and if ſo, then the Bed on which it lay muſt be of its own making: whence it will follow that the Flood coming on him while he lay in his Den; he was there drown'd, and cover'd with Slime or Mud, which ſince is turn'd into the Subſtance of the Earth before-

Plate X. Part IV. P. 105.

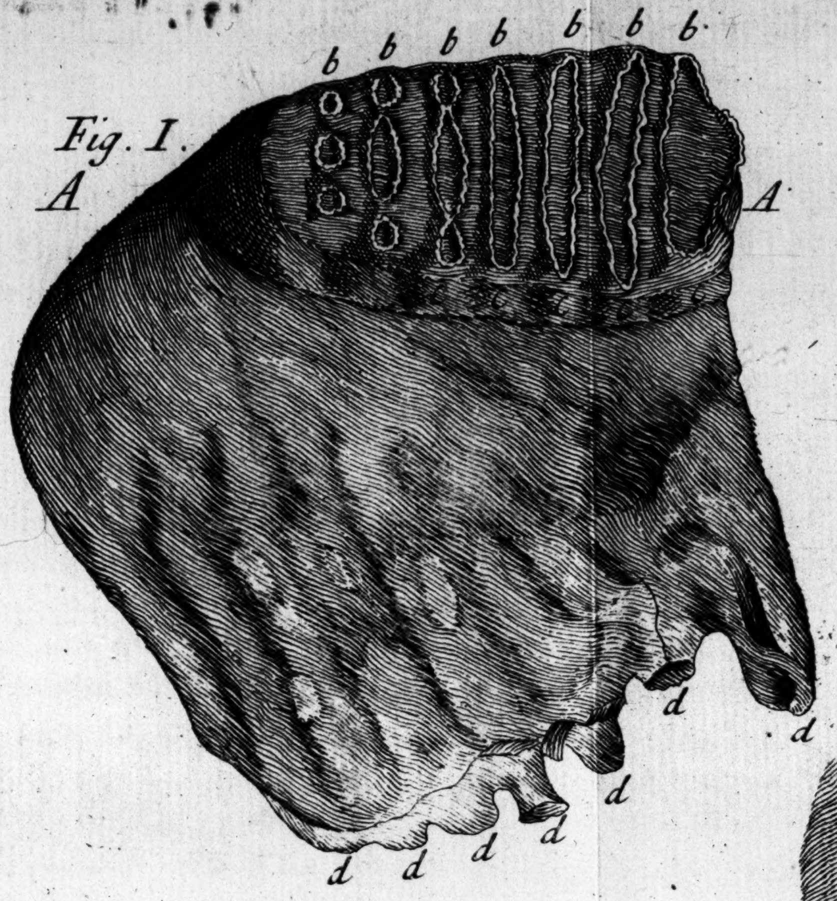


Fig. I.

b b b b b b b
A
A
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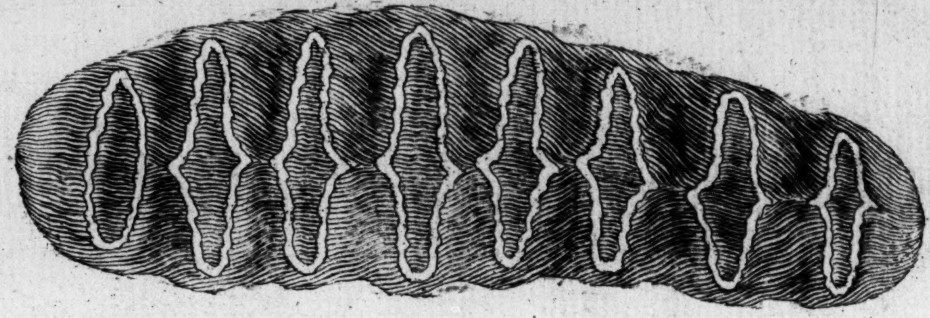

Fig. V.

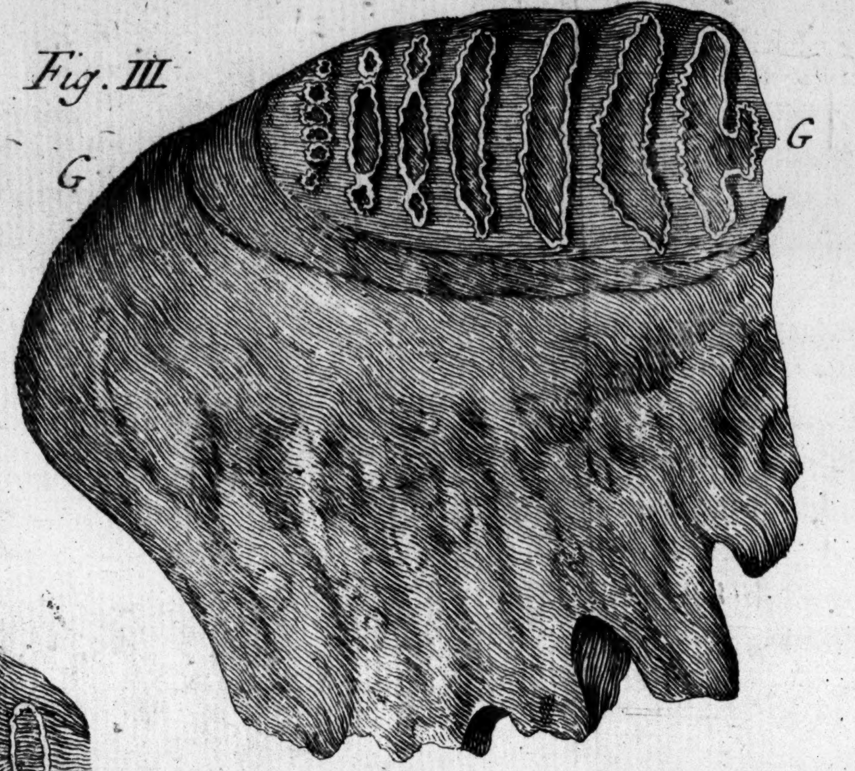

Fig. III.

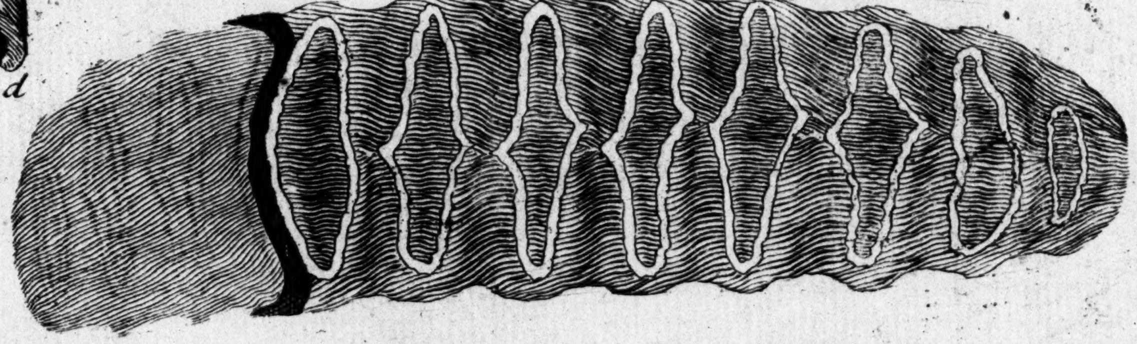

Fig. VI.

A Scale of Inches

1 2 3 4 5 6 7 8 9 9½

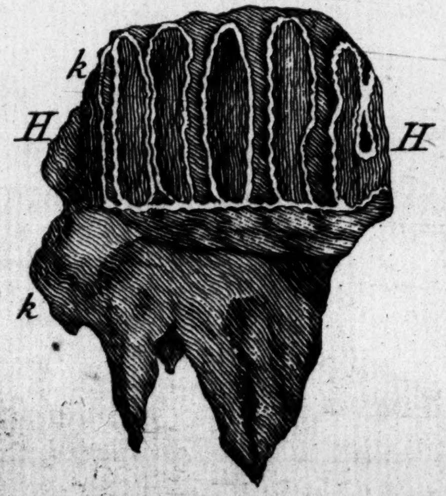

Fig. IIII.

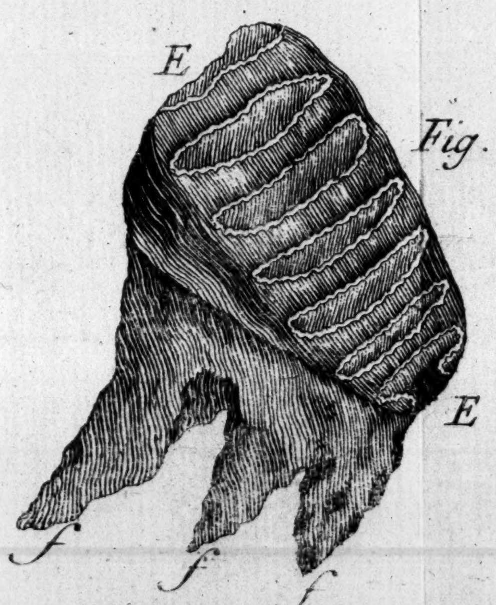

Fig. II.

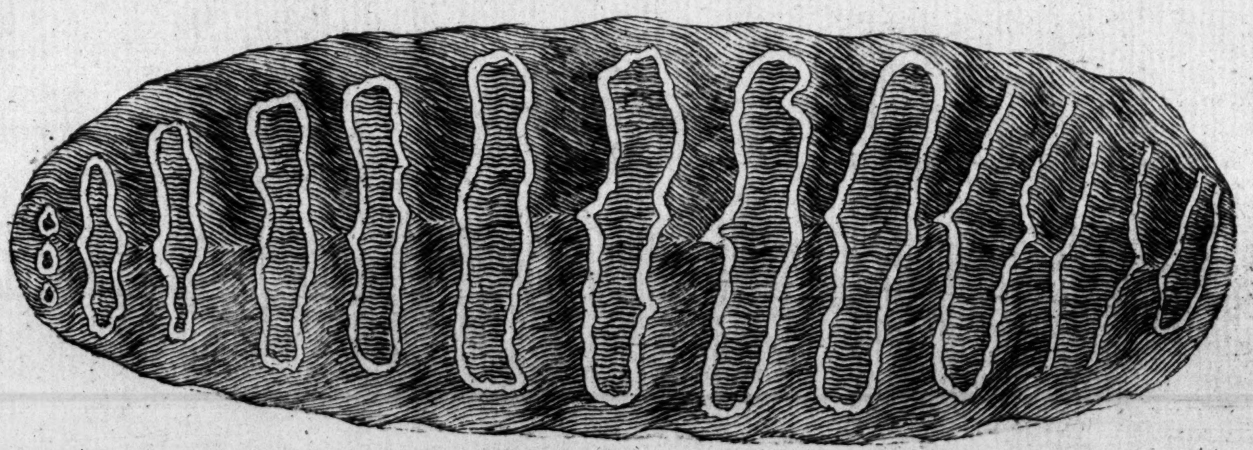

Fig. VII.

beforemention'd. I forgot to mention that there was a great many Nutſhells found about the Bed, perhaps thoſe might have been on the Buſhes which compoſed part of the Bed.

The two large Teeth are of equal Weight, two Pound three Quarters each; the two little Teeth are ſix Ounces each; but there are ſome of them waſted, and ſome of Holders that go into the Jaw broken off.

Remarks by Dr. Tho. Molyneux, ib. p. 370.

2. I am fully convinced, that they muſt certainly have been the *Four Grinding Teeth* in the lower Jaw of an *Elephant*, and that the many looſe Fragments of thoſe large Bones that were found with them, muſt have been Remains of the ſame *Animal*. This I take to be one of the greateſt Rarities that has been yet diſcovered in this Country. In order to clear this Matter 'twill be firſt requiſite to have recourſe to, and explain the annext Figures.

Plate 10.

Fig. 1. *A. A.* is the large Grinder of the under Jaw on the right Side, weighing two Pounds and three Quarters of a Pound. *b. b. b. b. b. b. b.* are white, rough, indented Borders, ſeven in Number, of an irregular Shape, riſing about the tenth of an Inch higher than the hard black ſhining Surface of the Tooth; this rough raiſed Work ſerves for the bruiſing and grinding the *Animal*'s Food, the tough Grains of Rize, Leaves, Fruits, and the Boughs of Trees; and is made of ſo extream an hard Texture, that it reſembles large knotted Threads of white *Glaſs*, laid on and cloſely faſtned to the dark Superficies of the *Tooth*: and anſwers that glaſſy Surface wherewith Nature has armed the Outſide of the *Teeth* of moſt *Animals*, to prevent their wearing from the conſtant Attrition in Chewing of their Foods. *c. c. c. c. c.* is that part of the Tooth which riſes above the Gums, and continues even now diſtinguiſh'd from the reſt of the Bone, by having its Colour of a different Shade. *d. d. d. d. d. d. d.* are many ſtrong Tangs or Roots, ſeemingly united altogether, by which the Tooth received its Senſe and Nouriſhment, and tho' it was large and ponderous, by theſe it kept firmly fixt into the Jaw.

For the Mechaniſm, Nature ſhews it ſelf to have followed in framing the *Teeth* of this *Animal*, is no more than this: whereas in other Creatures, ſhe has divided that bony Subſtance wherewith they chew their Food, each having its peculiar Roots to ſecure its Articulation in the Jawbone: ſhe has in this of ſo great Bulk (as *Pliny* the *Naturaliſt* ſtyles it *Terreſtrium maximum Elephas*) for the greater Strength, Stabiliment, and Duration of its *Teeth*, and the better to provide for a compleat Attrition of the Aliment, in order to perfect the Digeſtion ſo thoroughly, as to ſuſtain the Life of the Animal for two or three hundred Years, (as it is a common received Opinion in the *Eaſt*) ſhe has, I ſay, contrived to make the Subſtance of the *Teeth* in their Roots below, and in their upper parts above the Gums, cloſely unite together; and coaleſcing thus, form a few large maſſy Teeth inſtead of many ſmall ones.

As for inſtance, in *Man's Body*, that is of ſo much a leſs Size, the Number of the Teeth, (when the whole is compleat) reckons to thirty two, whereas in the large *Elephant*, the Teeth of both the Jaws amount in all but to eight, beſides it's two great Tusks, which rather ſerve as horns for its defence than Teeth to prepare its Food, and therefore I think not ſo very properly call'd Teeth.

Fig. 2. *E. E.* is the ſmaller *Grinding Tooth* of the under Jaw on the ſame ſide: it's Surface covered over with the ſame white indented Work, as before deſcrib'd for grinding of the Food. *f. f. f.* are three large Roots that kept it firmly fixt in the Jaw Bone. This ſmaller Tooth weighed full ſix Ounces.

Fig. 3. *G. G.* is the large *Grinder* of the under Jaw on the left ſide, much of the Size and Shape and Weight with it's fellow Tooth deſcrib'd Figure the 1*ſt*. It ſhews its Roots and all its parts, with the rough protuberant white Work on its upper Surface made after the ſame contrivance and form'd after the ſame ſtrong Model as the former. And truly, if one conſiders it, 'tis plain that were not the *Teeth* of this Creature made of ſo large a Size, and withal of ſo maſſy and firm a Subſtance, 'twere abſolutely impoſſible they could reſiſt the Force, and bear all that Preſſure wherewith thoſe vaſt Muſcles exert themſelves, that move the lower Jaw in Maſtication in this ſo ſtrong an Animal.

Fig. 4. *H. H.* is the ſmaller *Grinding Tooth* of the under Jaw on the ſame ſide; it is leſs compleat than the ſmall Tooth deſcrib'd before in Figure 2*d*. for ſome of the Root is wanting, and part of its outward grinding Surface is broke off at *k. k.* ſo that it weighs ſomewhat leſs; yet what remains exactly ſhews the ſame kind of Work and Shape of the other Tooth, that anſwer'd it on the right Side.

Theſe *Four Teeth* here deſcrib'd, fully compleat the Sett of the Teeth, wherewith Nature has furniſhed the lower Jaw of the *Elephant*; and are anſwered by juſt as many more, formed after the ſame manner in the upper Jaw, as Dr. *Moulins* informs us, who diſſected the *Elephant* that was burnt here at *Dublin* in 1681. In it's Anatomy *p.* 40. ſpeaking of the Teeth, he aſſures, there were beſides the Tusks only four Teeth in each Jaw, two in every ſide: and that theſe eight Teeth were all *Molares*, ſo that he had no *Inciſores*.

But notwithſtanding this, perhaps it will be ſaid, we may not haſtily conclude from hence, that our *Great Teeth* dug up in *Ireland* muſt certainly have been the *Four Grinders* of an *Elephant*, ſince they might as well belong to ſome other large kind of *Terreſtrial* or *Marine Animal*. As for the Hint of their being *Human* or *Gigantick*, 'tis ſo groundleſs a Thought, and ſo contradictory to *comparative Anatomy* and all *Natural Hiſtory*, it does not deſerve our Conſideration.

To obviate this, I ſhall take notice firſt in general, that the differing Kinds of living Creatures, wherewith Nature has ſtock'd the World, are not more diſtinguiſh'd by the Make of any part of their Bodies from one another than by the various Shape and Diſpoſition of their *Teeth*: and hence it is, we ſhall find any two diſtinct *Claſſes* of *Animals* that do exactly agree in the ſame Make and Ranging of their Teeth.

But yet to be more particular, I ſhall here ſet down at length the Words of two late Authors, that purpoſely have deſcribed the *Teeth* of the *Elephant*. The firſt Mr.* *Patrick Blair*, who ſays, *Dr.* Moulins *well obſerves that*

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* *Phil. Tranſ. n.* 325. *p.* 110.

that they are all Molares, *being two Inches broad in that part of them wherewith they Grind, and ſix Inches and a half long on the right Side, and five Inches and a half on the Left. Their Surface, tho' flat, is yet very unequal, for they have alternately placed, running from the Right to the Left Side, an Hollowneſs and then an Eminence; and this Eminence is ſurrounded by a rough protuberant Border. There are Nine of theſe Hollowneſſes and as many Eminences undulated as they paint Sea Waves.*

'Tis remarkable how very exactly all this agrees with our Figures; 'tis true thoſe *Hollowneſſes* and *Eminences* which he mentions to be *Nine*, do not ſo nicely hit with the Number of thoſe in our *Teeth*; but this Difference proceeds from hence, that he deſcribes here the Grinders of the upper, whereas ours are the *Teeth* of the lower Jaw; tho' ſuch a Diſtinction as this, I am apt to think, may very well ariſe even in thoſe of the ſame Jaw, in various Animals, from ſome peculiar Diſpoſition in one from another; nay and perhaps in the ſame Animal, at differing times, according as it happens to be older or younger, but this by the bye.

A little farther he ſays, * *The hind Tooth of the Right Side is four Inches, and that on the Left five; the one half of their Surface, where they begin to appear above the Gums, is ſemicircular, with the forementioned Ridges and* Sulci *running tranſverſly, four on the Right Side and five on the Left, the other half* (or Tooth I ſuppoſe he means) *has five of theſe Eminences where it grinds on the Right, and four on the Left: each of the four Teeth is ſix Inches long, and has ſix or ſeven of the forementioned Eminences and as many Depreſſions: theſe Teeth are the moſt firm, ſolid and weighty Bones of any Animal yet known.*

* *Phil. Tr. n.* 326. *p.* 114.

The other *Author* I ſhall produce is † Mr. *Ray*, who has the following Words of the *Elephant*, *Os pro mole Belluæ parvum, quatuor in utrâque maxillâ Dentibus molaribus ſeu Dentium molarium Maſſis inſtructum; ſi quidem* plurimi Dentes in Os ſolidum & durum *ita infixi ſunt, ut cum eo & inter ſe* unum & continuum Corpus *efficiant. Dentes hi lineas parallelas undulatas octo vel novem in ſuperficie maſſæ efficiunt; ſuntque reliquo oſſe* candidiores: *Maſſæ integræ, Dentium ſingularium modo, per Gomphoſin maxillis inſeruntur. Inciſoribus omnino caret.* Now by comparing the Particulars of both Accounts with the Deſcription and Figure we have before given of the *Teeth* dug up in *Ireland*, we may obſerve how they all agree exactly, even ſo as they tally together. But then perhaps it will be ask'd what is become of all the reſt of the *Teeth* that were in the upper Jaw, which being as firm and ſolid Bones as thoſe that are here preſerved, might for the ſame reaſon have ſtill remained entire.

† Synopſ. Animal. Quadrup.

But ſince we find it otherwiſe, 'tis obvious to imagine a probable Conjecture how this might come about. From what Mr. *Nevil* mentions in his Letter, 'tis plain that the Bed where all theſe Bones were found, muſt once have been the outward Surface of the *Earth*, the *Green Sod* producing *Ruſhes*, *Fern* and *Nuts*: and when the heavy Beaſt firſt fell dead upon this Spot, the Scull, with all the Bones and Teeth of the upper Jaw, being the higheſt Parts of the *Animal*, might likely fall in ſuch a Poſture, as to be expoſed ſome while above the *Earth*; tho' thoſe of the under Jaw firſt coming to the Ground, might make themſelves a Bed, and being covered with the Mould remain preſerv'd; whilſt the upper Teeth, and moſt of the other Bones, lying expoſed to the Injuries of the Air and Weather, before they got a Covering, might rot and quickly moulder all away.

But tho' this be allowed, yet ſtill a greater Difficulty remains unſolv'd; how this large body'd *Animal*, a *Native* of the remote warm *Climates* of the *World*, ſhould be depoſited in this wild *Northern Iſland*, (where *Greeks* or *Romans* never had a footing) ſo many Miles from Sea, and diſtant from thoſe Places of the Iſle where People might moſt probably reſort. And ſtill to make the Difficulty yet greater, we muſt conſider, not only from the dark black Colour of the Teeth, contracted by their lying long under Ground and the remarkable Alteration wrought on their bony Subſtance, which (by the mineral Steams and Exhalations it has imbib'd whilſt it was in the Earth) is now become more ſolid, hard, and ponderous, than it was naturally at firſt, (nay in ſome Parts we find it plainly petrified) but alſo from the periſhing of all the other Bones of the Animal's Body, and from the conſiderable *Depth* of *Earth* that covered thoſe that were found: we muſt conclude, I ſay from hence, that they have lain in this Place for many Centuries: I won't ſay with Mr. *Nevil* ever ſince the *Flood*, becauſe I can't ſuppoſe that the ſlight Texture of vegetable Subſtances, *Nutts* and the Seeds of *Ruſhes*, could poſſibly have been preſerv'd ſo long: But this, at leaſt, may ſafely be affirmed, that theſe Remains muſt be Cotemporaries with ſome of the remote Ages of the *World*; which carries us ſo far back into the earlieſt Times, that we can ne'er imagine the rude Inhabitants of *Ireland*, or any of their neighbouring Countries, were Maſters of ſo much Art, in thoſe Days of Ignorance and Darkneſs, as to make Carriages by Sea ſtrong and capable, or of Curioſity and Politeneſs enough, to tranſport a Beaſt of this large Size from thoſe far diſtant Countries where 'twas bred; which they that now attempt do find a Work of vaſt Care, Trouble and Expence, even in this Age wherein *Navigation* is brought to ſuch perfection.

Theſe Conſiderations, grounded on other Inſtances of the like kind, make me inclined to think this *Elephant* we are ſpeaking of, might not be brought hither by any Care or Induſtry of *Man*: but the Surface of this Terraqueous Globe might, in the earlieſt Ages of the *World*, after the *Deluge*, but before all Records of our oldeſt *Hiſtories*, differ widely from its preſent *Geography*, as to the Diſtribution of the *Ocean* and *Dry-land*, its *Iſlands*, *Continents* and *Shores*, ſo as to allow this Beaſt, and others of its kind, for ought I know, that may by ſome ſuch Accident hereafter be luckily diſcovered, a free and open Paſſage into this Country from the Continent. For otherwiſe, how can we e'er explain that that other vaſt, large, ſtately *Animal* the *Mooſe-Deer*, little inferior to the *Elephant* it ſelf, could have been brought into *Ireland*, (where elſewhere I have ſhewn it formerly was common) from diſtant *North America*, even long before that Quarter of the World was known, and is the only Region I can hear, where this great Beaſt is found at preſent. And can we well imagine that *Foxes*, *Otters*, *Badgers*, *Tigers*, *Wolves*, with *Linxes* and ſuch ravenous *Animals* as we have been told, have lately been diſcovered by the great Snows that fell this preſent Winter in the *Iſland* of *Sardinia* and other Places, ſhould ever be imported (being uſeleſs noxious Beaſts of Prey) by the Induſtry of *Man*, to propagate in *Iſlands*, that they might deſtroy *Men's* Food and Flocks, and make their Lives not only uneaſy but unſafe? Nay how can we ſuppoſe that *Birds* of ſhorteſt Flight, the various Sorts of poiſonous *Serpents*, and of offenſive *Creeping Vermin*, with all the various Tribes of ſmaller *Inſects*, could poſſibly be found in *Iſlands*, unleſs they had been ſtock'd with thoſe Inhabitants when the Intercourſe between them and the Continent was free and open.

But in whatever manner this *Elephant* (to return to our Subject) might firſt have made its way for *Ireland*; this is beyond diſpute, that the *Bones* of *Elephants* have been diſcovered deep under Ground, in other Places as well as this Kingdom; and thoſe too out of the way, far diſtant from the Native Countries of this Animal.

For not many Years ago, in a Hill near *Erfurt*, a Town of the *Upper Saxony* in *Germany*, ſeveral Parts of the *Skeleton* of an *Elephant* were Dug up: on which Occaſion *Wilhelmus Erneſtus Tentzelius* Hiſtoriographer to the *Duke* of *Saxony*, writ a Letter to the very learned *Antonio Magliabechi*, Library keeper to the great *Duke* of *Florence*. And I am well perſuaded, by the beſt Conſtruction I can make of thoſe imperfect and obſcure Accounts, we have in * *Evert Iſbrand Iddes* curious Travels from *Muſcovy* to *China* over Land; (which he confeſſes he only gathered from the barbarous *Oſtiacks* Inhabitants of that Country) concerning the vaſt *Teeth* and *Bones* and *Limbs* of **Mammuths** as he calls them, frequently found (and diligently ſought after to make profit of them) in the Hills, and Banks of ſeveral Rivers in *Siberia*, the *Keta*, *Jenize*, *Trugan*, *Montgamſea* and *Lena*; that they are nothing elſe but the Remains and *Skeletons* of *Elephants* buried there, and accidentally diſcovered by the *Earth*'s opening, and falling down on the ſudden Thaws, after ſevere long Froſts.

* *Ch.* VI.

But Mr. *Cambden* in his *Britannia* is of opinion, that thoſe great monſtrous *Teeth* and *Bones*, which he takes notice to have been at ſeveral times dug up in many parts of *Great Britain*, muſt have been the Remains of *Elephants*; but then he thinks, they muſt be of thoſe that *Dion Caſſius* tells us, the *Roman* Emperor *Claudius* brought over, when he made his Expedition into that *Iſland*. But that this truly is ſo, I own is but a ſurmiſe as yet, and has not been ſo fairly proved by him or any other, as that we can rely upon't with ſatisfaction.

Mr. *W.* † *Somner*'s Account of the Bones dug up near *Chartham*, agrees in many of its Circumſtances with that of Mr. *Nevil*; as that the Teeth were all Grinders, four in number, found with other large broken Bones near a Brook, and in a Claiey Earth, without a Stone; but then the weight and magnitude of our largeſt *Teeth* ſo far ſurpaſs thoſe that were found in *England*, that theſe did not come up to a fifth Part of thoſe, which ſhews they could not be the Teeth of the ſame Animal. I muſt confeſs the Author does not ſo much as ſuſpect they were *Elephant's Teeth*, but on the con-

† *Phil. Tranſ. n.* 272. *v. ſupr. p.* 27.

trary is of opinion that they belong'd to another *Species*, the *Hippopotamus* or *River-Horſe*, a Beaſt that's yet a greater Stranger in theſe Parts of the World, than the *Elephant* it ſelf; and therefore it's Paſſage hither can never be accounted for, but by ſome ſuch like Suppoſition as we have made.

And if the *Figures* of the *Teeth* there given us be genuine and well expreſt, they no way ſeem to agree either in Shape or Make, or in that particular and *Characteriſtick* Work on the grinding Superficies, with the *Teeth* of the *Elephant*; or with the Deſcription and Figures we have given, which I am ſure are both correct and natural.

Further Remarks, ib. p. 383.

3. This Letter of Mr. *Nevile* with Dr. *Molineux*'s curious Draughts of the Teeth, and his learned Remarks upon them, having been produced and read before the *Royal Society*, they ordered that what Teeth they had of like ſort ſhould be look'd out and laid before them; to which Sir *Hans Sloane* was pleaſed to furniſh a yet greater Variety, out of his incomparable Collection of *Natural Rarities*. And to obviate all Doubts, there being at this time in *Weſtminſter* the entire Skull of a large Elephant with the Teeth in it, That was likewiſe ordered to be viewed and compared with the Figures: which done, it appeared that the Teeth in queſtion could be no other than thoſe of an Elephant.

By this Enquiry we were likewiſe ſatisfied, that the Number of Teeth found, being but four, was no Objection: it appearing that the Number of *Molares* in this Animal is not certain. * *Pliny* ſays expreſly, *Dentes Elephanto intus ad mandendum quatuor, præter eos qui prominent.* And in the Remains of that mighty Elephant deſcribed by † *Tenzelius*: there were no more than four Teeth found. In that at *Weſtminſter* there are Six, *viz.* One in each lower Jaw, and Two in each of the Upper, whereof the inner Tooth is about three times as long as the other, and both together longer than thoſe of the under Jaw by about an Inch; the upper ſmall Teeth being much worn by grinding. Theſe we have thought fit to repreſent by *Fig.* 5. ſhewing the rough grinding Surface of the left under Tooth, being conſiderably *Concave*; and by *Fig.* 6. the ſame Roughneſs on the upper Teeth is ſhewn, having a *Convexity* tallying with the *Concavity* of the under, which is a Circumſtance not obſerved by any of thoſe that have deſcribed them. And altho, by the Obſervation of Mr. *Du Verney*, Dr. *Moulins*, and Mr. *Blaire*, who diſſected three different Elephants, it appear that each of them had eight *Molares*: yet from them it is alſo evident that in the diviſion of them Nature obſerves no Rule. For Dr. *Moulins* found the two Teeth in each of the upper Jaws of that he diſſected, to be divided after a different manner; ſo that the inner Tooth on the one ſide, and the outer on the other, was bigger than its adjoining Fellow, yet not ſo as to be very unequal: and Mr. *Du Verney* and Mr. *Blaire* had on both ſides the much greater Tooth outwards: whereas the *Weſtminſter*-Skull, on the contrary, has only a ſmall one outwards, and the much greater Grinder within. All which conſidered, we may with Aſſurance conclude, that this Elephant found in *Ireland* had but four Teeth in his Head when he died; and that the two Greater were thoſe of the upper Jaws, and the other two thoſe of the Under. Again, by the

Size

* Lib. XI. *cap.* 37.

† *Phil. Tranſ. n.* 234. *Abr.* Vol. II. *p.* 438.

Size of the grinding Part, we may conclude theſe to be the Teeth of a very young and ſmall Elephant; ſince they are not much above half the Length of thoſe that are to be ſeen at *Weſtminſter*, which belonged to a Beaſt of not more than between 10 and 11 Foot high; nor much above one Third of the Length of a foſſile Elephant's Grinder in the *Royal Society*'s Repoſitory, the which is here repreſented by *Fig.* 7. (all the *Figures* being drawn to the Scale of half their true Dimenſions.) Hence it is not to be marvelled that the Bones of ſo young an Animal, having not acquired their Firmity, as being in a growing State, ſhould be diſſolved by long lying in the Earth, as alſo the Roots of the Teeth.

On this Occaſion, perhaps it may not be amiſs to quote a Paſſage out of *Mathew Paris* his Hiſtory, who aſſures us, that in his Time *Louis* IX. (afterwards St. *Louis*) King of *France*, made a Preſent of an Elephant to his Cotemporary *Henry* III. of *England*; and that in the Year 1255, after the *Engliſh* had been fourſcore Years Maſters of *Ireland*. Of this ſays *Matthew*, *Nec credimus quod unquam aliquis Elephas viſus eſt in* Anglia *præter illum.*

Large Bones and Teeth in New-England, *by Dr.* Mather. *n.* 339 *p.* 62.

XXVII. In *Albany* in *New-England* were lately found Bones and Teeth of ſome large Animals, which for ſome reaſons are judged to be human; particularly a Tooth brought from the Place where it was found, to *New York*, 1705. being a very large Grinder, weighed four Pounds and ¼, with a Bone ſuppos'd to be a Thigh Bone 17 Foot long. There is another Tooth, broad and flat like a fore Tooth, four Fingers broad; the Bones crumble to pieces in the Air after they are dug up; they were found near a Place call'd *Cluverack*, about 30 Miles on the ſide of *Albany*, towards *Boſton*. One is like the Eye Tooth of a Man, it has four Prongs or Roots, flat and ſomething worn, on the top it was ſix Inches high, lacking one eighth, as it ſtood upright on its Root, and almoſt thirteen Inches in circumference; it weigh'd two Pounds four Ounces *Troy* weight: There was another near a Pound heavier, found under the Bank of *Hudſon*'s River, about fifty Leagues from the Sea, a great way below the Surface of the Earth, where the Ground is of a different Colour and Subſtance from the other Ground, for ſeventy five Foot long, which they ſuppoſe to be from the rotting of the Body, to which theſe Bones and Teeth did, as ſuppoſe, once belong.

Large Bones found near Colcheſter, *by Mr.* Luffkin. *n.* 274. *p.* 924.

XXVIII. At *Wrabneſs*, a ſmall Village ſituate in the moſt Eaſtern parts of *Eſſex*, upon the River *Stowr*, near *Harwich*, diverſe Bones of an extraordinary bigneſs, were found at 15 or 16 Foot beneath the Surface of the Earth, in digging for Gravel to mend the Roads with, *&c.* the largeſt and moſt remarkable of which, was procured, and ſent to me, by Mr. *Rich*, Miniſter of the Place.

We read in * *Cambden*, that in the time of King *Richard* II. and in the Reign of Queen *Eliz.* there were found in the moſt Eaſtern Promontory of *Eſſex*, at a place called *Cidulſineſs*, which I take to be *Walton*, large Teeth, and Bones of an extraordinary bulk, which were eſteemed the Bones of Giants. But Mr. † *Childrey* rather thinks them to be the Bones and Teeth of ſome Elephant, buryed there by their loving Maſters the *Romans*.

That

* *Pag.* 351.

† Britan. Bac. *p.* 100.

That theſe were the Bones and Teeth of ſome Elephant, I am prone to believe; firſt, becauſe they far ſurpaſs in Magnitude the Bones, *&c.* of the largeſt Creatures that we have at this day in our Iſland. Secondly, Becauſe 'tis evident from *Dio Caſſius*, as quoted by Mr. * *Camden*, that abundance of Elephants were brought over into *England*, by the Emperor *Claudius*, in the War with the *Britains*; yea, into *Eſſex* it ſelf; as appears from the ſame *Dio* a little after. Thirdly, In comparing this Bone with the Oſteology of Dr. *Mullins* in his Anatomical Account of the Elephant burnt at *Dublin*, *&c.* I find it perfectly agree to and with the *Os Humeri* thereof, not only to outward Appearance or Form, but to Meaſure alſo; whence we may conclude, theſe were the Bones of ſome Elephant, rather than any other Animal.

* Britannia. *p.* 347.

Dimenſions of Human Bones near St. Albans, *com. by Mr.* Cheſelden. *n.* 333. *p.* 436.

XXIX. The Circumference of the Scull, according to its length 26 Inches, according to its breadth 23 Inches.

The greateſt Diameter of each *Os innominatum* 12 Inches.

The left *Os Femoris* 24 Inches long, having only One, and that the great *Trochanter*. The right *Os Femoris* 23 Inches long, having three *Trochanter Proceſſes*.

Each *Tibia* 21 Inches long.

If all the Parts bore a due Proportion, this Man muſt have been eight Foot high. They were found near an Urn inſcrib'd *Marcus Antoninus*, in the Place of the *Roman* Camp near St. *Albans*.

Antiquities in New-England, *by Dr.* Mather. *n.* 339. *p.* 70.

XXX. At a place call'd *Amuskeag*, a little above the hideous Falls of *Merimack* River, is a huge Rock in the midſt of the Stream, on the top of which are a great number of Pits, made exactly round like Barrels or Hogſheads of different Capacities, ſome ſo large as to hold ſeveral Tuns; the Natives know nothing of the Time they were made, but the neighbouring *Indians* have been wont to hide their Proviſions in them in their Wars with the *Maqua's*, affirming that God had cut them out for that Uſe for them. They ſeem plainly to be Artificial.

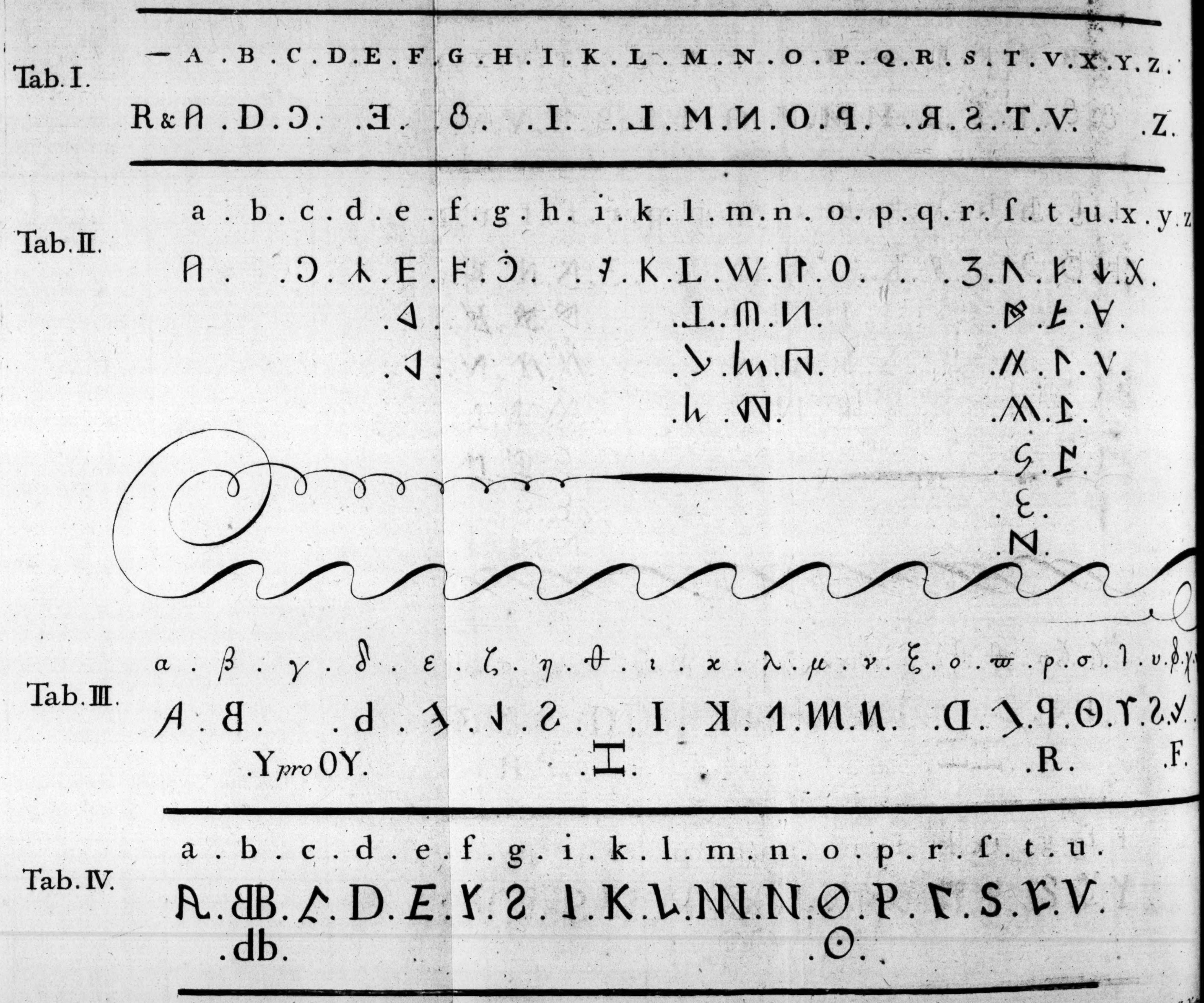
At *Taunton*, by the ſide of a tiding River, part in, part out of the River, is a large Rock; on the perpendicular ſide of which, next to the Stream, are ſeven or eight Lines, about ſeven or eight Foot long, and about a Foot wide each of them ingraven with unaccountable Characters, not like any known Character. Two of them are repreſented, *Fig.* 7.

Plate 8. B.

An ancient Tuſcan *Inſcription, from Dr.* Hickes *to Sir* Hans Sloane. *n.* 302. *p.* 2076.

XXXI. Perluſtravi, Vir Clariſſime, quam deſcriptam ad Societatem Regiam perferendam dederunt D. D. *Spanhemius* & *Geoffroy*, Iconem, unà cum D. *Boivini* diſſertatione de eâ Gallicè ſcriptâ, in qua TAGIS eſſe juvenili ſpecie imaginem iſtam, quæ ad te nuper à *Lutetiâ Pariſiorum* miſſa eſt, multis argumentis contendit. Verùm ſive TAGES apud Hetruſcos Aruſpicinæ auctor, ſive gladiator, ſive forte qui à Ludis publicis Lauream reportaverit, ſive denique quis alius ſit, quem Icon illa adumbrat, ea, quæ femori ejus, crurique ſiniſtro Characteribus Hetruſcis inſcribuntur, pro *Alphabetis* linguæ Hetruſcæ, quæ docti nobis dederunt, aut dediſſe ſperarunt, alio alioque

Plate XI. Part IV. P. 113.


Tab. I.
A . B . C . D . E . F . G . H . I . K . L . M . N . O . P . Q . R . S . T . V . X . Y . Z .
Tab. II.
a . b . c . d . e . f . g . h . i . k . l . m . n . o . p . q . r . ſ . t . u . x . y . z
Tab. III.
α . β . γ . δ . ε . ζ . η . θ . ι . κ . λ . μ . ν . ξ . ο . ϖ . ρ . σ . τ . υ . φ . χ
.Y pro OY.
.R.
.F.
Tab. IV.
a . b . c . d . e . f . g . i . k . l . m . n . o . p . r . ſ . t . u .
.db.

que modo per literas Romanas Græcaſq; eatenus facilè deſcribi poſſunt, quatenus Scriptionis Characteres integri, & illæſi in eis ſuperſunt. Alphabeta verò, quibus utimur in iis legendis, quatuor ſunt: Scilicet Patris *Franciſci Giambullari* unum, alterum Anonymi Deſcriptoris, tertium *Jani Gruteri*, & quartum *Andreæ Brogiotti F.*

Primum, in quo Characterum Hetruſcorum figuras, & poteſtates expreſſit * *Franciſcus Giambullari*, extat in egregio ſuo libello de Origine Linguæ Florentinæ Italicè Scripto, cui titulus hic eſt. *Origine della Lingua* Florentina: *altrimenti* IL GELLO DI M. PIER. FRANCESCO GIAMBULLARI *Acadimico Fiorentino.* in FIORENZA M.D.XLIX. † characterum Hetruſcorum, figuræ, quas à dextrâ verſus ſiniſtram pictas dicit, cum eorum poteſtatibus per literas Romanas expreſſis delineantur ut in Tab. I.

* *Vide hujus viri Eulogium in præfatione generali* Georgii Hickeſii *ad Antiqua Literaturæ Septentrionalis duos libros nuper* Oxoniæ *à ſe Editos.* p. 4. & 24.

† p. 97. *Plate* II.

In ſecundo, quod invenire eſt inter monumenta Hetruſca, quæ ad veſtram Societatem miſit *R. Fabrettus*, Hetruſcorum characterum figuræ, & poteſtates ab Anonymo eo modo in Tab. II. deſcribuntur.

In tertio, *Janus Gruterus* libri ſui *vett.* Inſcriptionum pag. CLXV. tabularum *Eugubinarum* characteres Hetruſcos, cum eorum poteſtatibus per Græcas literas deſignatis, ut eas ipſe animo finxit, exhibet; quas videas in Tab. III.

In quarto autem, quod *Andreas Brogiottus F.* delineavit in libro ſuo, qui inſcribitur INDICE DE CARATTERI *con l'inventori & Nomi di eſſi eſiſtenti* NELLA STAMPA VATICANA & CAMERALE in ROMA. M.DC.XXVIII. Hetruſci Characteres ſeptem tabularum æneàrum, quæ *Eugubü* jam pridem repertæ erant, longe aliter ac apud *Gruterum*, & me judice, multo etiam verius, cum valore ſuo per literas Romanas denotato, exprimuntur, ut in Tab. IV.

Juxta primum Alphabetorum, quæ in tabulis exhibentur, uno atque altero Charactere etiam ex ſecundo in ſubſidium evocatis, inſcriptionis Hetruſcæ, quæ in ſiniſtro femine crureque cernitur Ectypi tui TAGIS à dextra ſiniſtram verſus, lectio hæc eſſe videtur:

MI. GLEDEM: STULPOE: ADI [a] IMI
CASSI: D [b] GD [c] II. XD. CECLES: CEVA:

Juxta autem iſtud *Jani Gruteri*, quod tertium eſt ordine Alphabetum, ſic legenda eſt inſcriptio,

μι: ωζεδεμ. υλȣζαωε: αοιλιμι
ωαυ . . ι: ο. [d] ωο [e] χα. ϖεπζεν: ϖε [f] α:

Verùm ſecundum ultimum, quod delineavit *Andreas Brogiottus F.* ſic deſcribenda eſſe videtur.

[a] *forte* K.
[b] *forte* A.
[c] *forte* V.
[d] *forte* N.
[e] *forte* MI.
[f] *forte* TZ.

[g] *forte* Z.
[h] *forte* ZZ.

MI. GLEDEM : [g] RULAGE : ADIFIMI
GA : [h] I : D, ... GG ... XD. CECLEN : CETA :

Inſcriptions at York, *by Mr.* Thoreſby. *n.* 303. *p.* 2145. **Ph.Tr.n.*149. *p.* 238. *Abr. Vol.*III.*p.*419.

XXXII. 1. A *Roman* Monument was lately diſcovered at *York* in digging a Cellar in *Coning-ſtreet*, not far from the *Roman* Wall and Multangular Tower, that *Dr. *Liſter* has given ſo curious and particular a Deſcription of. This Monument, Dedicated to the *Genius*, or Tutelar Deity of the Place, is not of that coarſe Rag, that the generality of the *Roman* Monuments are, but of the finer Gritt: 'Tis 21 Inches long and 11 broad, and is inſcribed GENIO LOCI FELICITER. There was a largerStone found with it, but without any Inſcription; nor is there upon either of them the repreſentation of a Serpent, or a young Viſage, by both which the Ancients ſometimes deſcribed theſe *Dü Topici*; if the Name had been added, it would have gratified the Curioſity of the *Neoteric* Antiquitaries; but they muſt yet acquieſce (for ought I know) in the old DVI, who is ſaid to be the *Tutelar Deity* of the *City* of the *Brigantes*; from which *Diw*, as the *Britains* call'd him, *Dewsbury*, or *Duisburg* in this Neighbourhood, ſeems to have receiv'd its name; a place now chiefly noted for a ſort of coarſe Cloath there made, and thence called *Duberians*. The Monument is as Fig. 8.

Camden's *Brit. N. E. p.* 708.

Plate 8.

The Author of this *Votive* Monument ſeems to have had the ſame Superſtitious Veneration for the *Genius* of *York*, as thoſe at *Rome* had for theirs, whoſe Name they were prohibited to utter, or enquire after; hence it is upon their Coins the Name of this Deity is never expreſſed, but in a more general manner by *Genius P. R.* or *Pop. Rom.* Such a one I have of *Conſtantius*, minted at *London*, as appears by the Exurg LON. under the Effigies of that Deity, with a *Patera* in the Right Hand, and *Cornucopia* in the Left, inſcribed GENIO POPULI ROMANI. I rather inſtance in that of this Emperor (the Father of *Conſtantine* the *Great)* becauſe he made *York* his Imperial Seat, and was here Deifyed; the Medal of whoſe *Apotheoſis* I alſo have, minted at the ſame place and inſcribed MEMORIA FELIX, which I mention (tho' nothing relating to the Genius) becauſe of the expreſſion of a noted Antiquary, "That " *Rome* in the height of its greatneſs, had not a more glorious and gal- " lant ſhow to exhibit, than what this poor piece of Copper would ex- " preſs. As the *Genius* of the *City of Rome* was expreſſed by G. P. R. ſo that of the *Commonwealth*, in a moſt ſordid Flattery, by that of the *Emperor*, who they pretended to be their *Happy Genius*. I have one even of *Nero*, and not only after his *Quinquennium*, but the year after he had laid moſt of the City in Aſhes; yet by the expreſs order of the Senate, inſcribed GENIO AUGUSTI. S. C. Some of the Fathers have therefore juſtly reproach'd the *Romans*, for paying a greater Veneration to the *Genii* of their Emperors, than to *Jupiter* their ſupream God. This Cuſtom of Deifying the *Genii*, and that of aſſigning *Gods* for defence of particular

Burton's Com. upon Anton. Itin. p. 78.

particular Cities, is very ancient, as appears by what the Prophet *Jeremiah* ſaith of revolting *Judah*, *According to the number of thy Cities are thy Gods*; after the manner of the Heathen, who, according to *Varro*, had above * thirty thouſand; and yet notwithſtanding this prodigious number, it is evident from their Medals, that ſeveral Cities were ſometimes aſſigned to the ſame Tutelar Deity; thus the *Greeks* (from whom the *Romans* receiv'd this and ſeveral other of their Superſtitions) committed both *Magneſia* and *Smyrna* to the protection of *Cybele*. Medals of the former are more common, of the latter more rare. I have one which has the Effigies of that *Mother of the Gods* with her Towered Head, and CMYPNA; upon the Reverſe is a Lyon Paſſant with CMYPNAIΩN. I have alſo a large curious Medal of *Julius Philippus*, that would tempt us to believe that *Antioch* alſo was devoted to the ſame *Cybele*, for it has round her Head with the Turreted Crown ANTIOKEΩN MHTPOKOΛΩN. with Δ (or rather Λ) E and SC on each ſide the Head. I muſt own my ſelf ſomewhat at a loſs about the latter word, except the *Greek* and *Roman* Tongues began then to admit of a ſort of Mongril Mixture, ſo that from MHTEP and *Colonus*, might proceed MHTPOKOΛΩNΩN, and ſo the *Antiochians* have the Title of the Men of the Mother-Colony, the Λ E which are *Greek*, the SC in *Latin* Characters, the former ſignifying *Luſtrum Quintum*, the other *Senatus Conſulto*, ſeem to countenance this Conjecture, the *Roman* S being different from that in ΦΙΛΙΠΠΟC and CEBαϛὸς upon the ſame Coin.

Jer. ii. 28. *and* xi. 13.

**Pool's Synop-Critic. in loc.*

This Curioſity of the City of *Antioch* is not ſo valuable as it was the Metropolis of all *Syria*, and highly applauded by *Ammianus Marcellinus* (who lived within a hundred years of this time) as it is becauſe here the name of *Chriſtians* was firſt taken up, and that St. *Paul* both preached and kept a Synod here, as *Euſebius* tells us, and ſo another I have of *Antoninus Pius*, inſcribed BEPOIAIΩN, which is more valuable in my Fancy for that paſſage *Acts* XVII. 2. than if it could be certainly aſcribed to the nobleſt of the four Cities that bore the ſame Name.

2. A Funeral Monument, whereupon, under the Statue (in *Baſſe-relieve*) of the Standard-bearer of the 9th Legion, is this Inſcription.

*n.*305.*p.*2194.

L DVCCIVS
* Lubens voluit *L·VoT. RVFI
·NVS·VIEN
SIGNF. LEG.VIIII·
AN·XXIIX·
Hic ſitus eſt H. S. E.

This Monument was found in *Trinity-yard* in *Micklegate* at *York*. That the 9th Legion was in *Britain* in *Galba*'s time, and that it was alſo *Hiſpanienſis*, appears from the very Learned Sir *Henry Savile*'s Notes at the end of his Edition of *Tacitus*; but that it, as well as the VIth and the XXth, was alſo called *Victrix*, or that it reſided at *York*, has not been obſerved before; and yet both are evident from this Inſcription upon a *Roman* Brick found there. LEG. IX. VIC.

This is alſo an Argument of the Peace theſe Parts enjoyed at that time, (poſſibly the latter end of *Severus*'s Reign,) making Bricks, caſting up Highways, *&c.* being the uſual employment of Soldiers at ſuch vacancies.

Sir *Hen. Savile* was of opinion that this *Nova Hiſpanienſis* in *Britannia* was one of thoſe eſtabliſhed by *Tiberius*, *Caius*, or *Claudius*, or peradventure in the later times of *Auguſtus*; but however that it was certainly here in *Nero*'s Reign, and that *Pætus Cerealis* was then Lieutenant thereof is indiſputably evident from *Tacitus*, (*lib.* 14. *cap.* 10.) who gives a lamentable account of the ſlaughter of ſeventy thouſand Citizens and Confederates, by the enraged *Boadicia*, in which number was all the *Foot* of this ninth Legion: *Cerealis* with the Horſe hardly eſcaping. I ſuppoſe it needleſs to add, that this Number is frequently by the *Romans* writ VIII as well as IX; for one that is but competently vers'd in their Coins or Inſcriptions, cannot but have obſerved inſtances of both kinds: however, *Roger Gale*, Eſq; was ſo kind as to ſend me a new Tranſcript; and I have by me alſo a third, lately taken by a grave Divine; all which agree that it is the IXth Legion, which is alſo confirm'd by the other Inſcription upon the Brick, which was but lately found. I ſhall only add what Mr. *Tho. Hearne* of *Oxford* writes, “ I am
“ mightily pleaſed with the Inſcriptions you ſent me relating to the 9th
“ Legion, there being now no room to doubt about the place of Reſidence,
“ a thing which was unknown before; and for that reaſon,
“ thoſe who have written about the *Roman* Legions have ſaid nothing
“ about this, but leave us quite in the dark; only *Urſatus* * does re-
“ mark, that it muſt be ſomewhere in *Britain*, becauſe *Tacitus* tells us,
“ that when the Colony at *Camalodunum* was deſtroyed by *Boadicia*,
“ *Pætilius Cerealis*, Legate of the IXth Legion, came to their aſſiſtance;
“ but yet he makes no mention of its being ſtiled *Victrix*.

An ancient Inſcription from Arragon, *by* Dr Muſgrave. *n.* 337 *p.* 157. *Plate* 12.

XXXIII. Jam nunc ante oculos Marmor eſt, *Tarracone* inventum, album, uncias decem cum ſemiſſe longum, octo & dimidiam latum; in quo Inſcriptio, Literis hic dimidio minoribus ære *Cyprio* inciſis, integre legenda eſt ut *Fig.* 1.

Diis Manibus. Camilius Saturnalis Camiliæ Natulæ. *Patronæ merentiſſimæ fecit.*

Camilius Saturnalis, olim ſervus, at jam Libertus, utpote a *Camilia Natula* manumiſſus, ea de cauſa Patronæ, a qua cum Libertate Nomen accepit, grate hoc monumentum poſuit.

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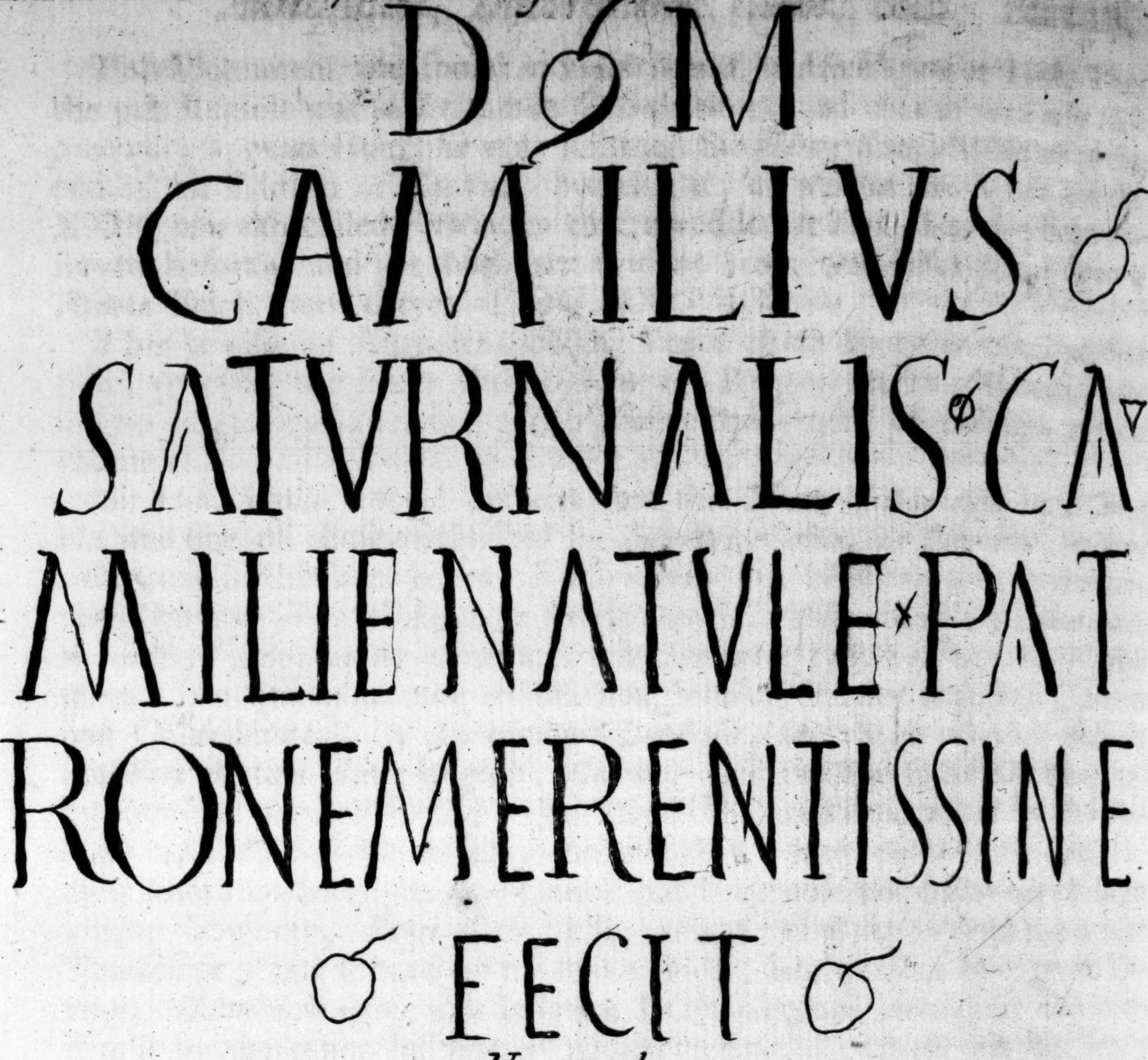
* De Notis Rom.

Plate XII. Part IV. *P.117.*

Fig. 1.

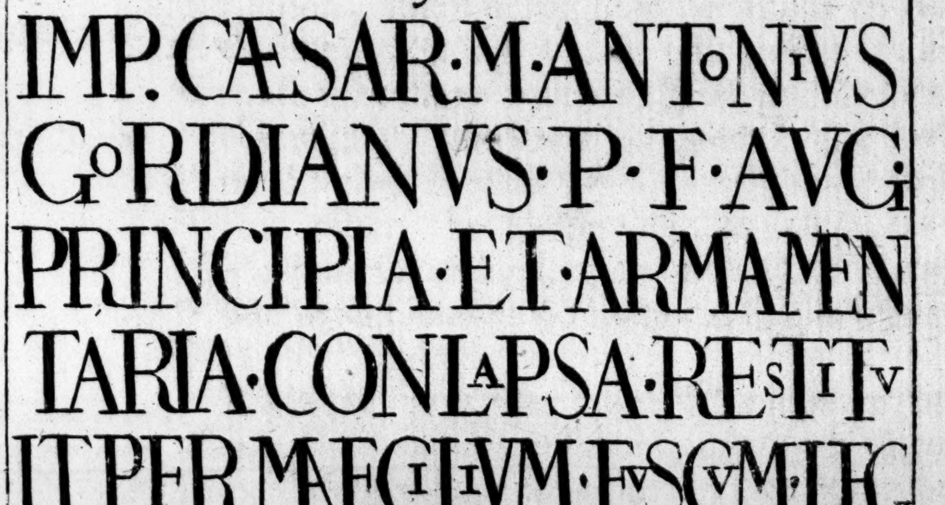


D ❦ M
CAMILIVS ❦
SATVRNALIS ❦ CA
MILIE NATVLE · PAT
RONE MERENTISSINE
❦ FECIT ❦

Unc. 10 ½.

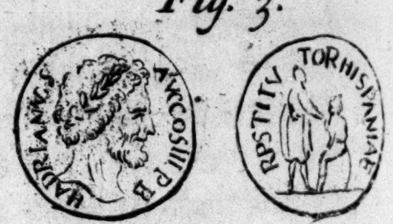
Unc. 8¼.

Fig. 2.



IMP. CAESAR·M·ANTONIVS
GORDIANVS·P·F·AVG
PRINCIPIA·ET·ARMAMEN
TARIA·CONLAPSA·RESTITV
IT PER MAECILIVM·FVSCVM·LEG
AVG·PR·CVRANTE·M·AVR
QVIRINO·PR·COH·I·L·GOR

Fig. 3.


HADRIANVS AVGCOSIII P P
RESTITV TORI HISPANIAE

Plurima ſunt hujuſmodi paſſim monumenta; quod ex *Grutero*, *Reineſio*, aliiſq; patet. Quis autem hic *Saturnalis*, quæve hæc *Natula* fuerit, æque mihi ignotum eſt, ac quod ignotiſſimum. Habet nihilominus Inſcriptio non pauca, quæ notatu digna videantur.

Prima tantum A lineam habet tranſverſam; reliquæ omnes *Perpendicularem*, cruribus interpoſitam, hunc fere in modum A; quod, Imperio ad occaſum vergente, primum in uſu fuiſſe judico. Utut illa res ſit, hanc hujuſce Literæ formam, alibi quam in hoc Lapide, nondum me vidiſſe memini. Miror eam omitti & in *Bouterovii* & in Doctiſſimi *Bernardi* Alphabetis. Raram igitur exiſtimo.

E ter quater hic pro Æ: qua de re vide Commentarium in *Julii Vitalis* (1) Epitaphium. In omni hujus Inſcriptionis E, lineæ tres parallelæ, a *perpendiculari* incipientes, ſunt & perbreves, & inter ſe æquales.

Linea 4ta. In utraq; Conſonante L L, Lineola, cui *perpendicularis* inſiſtit, eſt breviſſima: hinc videtur *Rhodius* (2) ad *Scribonium Largum*, aſſeruiſſe, [*Veteres figura parum diverſa Literas* I *&* L *finxiſſe*, *notiſſimum eſt.*]

PAT-RONE. De ſyllabæ mediæ iniqua diviſione, non eſt ut verba faciamus; cum [*hujuſmodi Errorum*, (ut ait *Dauſquius* (3) *ſegetem peramplam habent veteres Inſcriptiones.*]

Eadem fere *Patronæ*, atq; *Patroni* ratio. Impp. *Diocletiano* & *Maximo* A. A. ſancitum eſt, [*neq; Patronæ tuæ obſequiis refragari te fas eſt :*] quam ad Legem *Gotofredus* [*ut* Patrono *ita* Patronæ *debetur obſequium*] (4.)

MERENTISSINE pro MERENTISSIMÆ. M in N μεταστοιχειοῦται. (5) *Priſciani* Sententia M mutatur in N; potiſſime C. D. T. vel Q. ſequentibus: (ut in *Anceps*, *Eundem*, *Identidem*, *Tanquam.)* Sed, ut quod verum eſſe ſuſpicor, agnoſcam, Operarii hoc erratum eſſe judico, Literam N, nuperrime ſculptam, oſcitanter iterantis.

Nomen hoc eſt *Participiale*, maxime in Lapidibus uſurpatum. Sic *Gruterus* (6.)

REGIVS ARISTIVS PRIMITIVVS ARISTIÆ FILETINI PATRONÆ BENEMERENTISSIMÆ ET REGIVS HERMES VXORI MERENTISSIMÆ. P.

Punctorum hujus Inſcriptionis incerta ratio eſt; alia vocabulis integris ſubjiciuntur, ut in Linea 4ta, alterum gladioli, alterum H dimidiatæ formam habens, ſic ⊣: tertium triangulare, in fine lineæ tertiæ, poſt ſyllabam C A; ſed omnino nimium.

De Foliis, quæ in Lapidibus cum Epitaphiis incidi ſolent, olim à me (7) poſt alios dictum. Hic autem obſervatu dignum eſt, Herbarum folia, quæ cum Epitaphiis ut Humanæ imbecillitatis indicia adhibentur, non ea de cauſa hic præſtari: hic, inquam, ubi nihil niſi animum beneficiis obligatum, & lætitia plenum, oſtendit Lapis. Idem mea ſententia dicendum de foliis, quæ in (8) *Longinorum* Altari, quæq; in Altari quod *M. Aurelio* (9) *Antonino* dicatum fuit, incidebantur. Hæc igitur mera ornamenta cœlatoris ingenio deberi cogitandum eſt.

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(1) Pag. 138. (2) Pag. 307. (3) Orthographicorum Vol. I. p. 157. (4) Cod. lib. VI. Tit. VI. Leg. 8. (5) Lib. I. Ed. Putſchian. (6) Pag. 932. n. 7. (7) Comment. in *Julij Vitalis* Epitaphium, p. 187.

Camilii nomen a Patrona *Camilia Saturnalem* accepiſſe, dixi; quod *Romanorum* more factum eſt. Hac de re (10) *Lipſius* [*Idem* (ſervi) *manumiſſi, in nomina Dominorum veniebant, cognomine excepto: loco cognominis vetus ſuum nomen retinebant*, ut *Marcus Tullius, Tyro:* Ciceronis *Libertus.*]

[*Libertus*, affirmante *Paulo* J. C. (11) *ineſtimabilis res eſt.*] [*Nihil* (12) *ea gratius ſervo præſtare poteſt.*] Patroni, qui ſervos manumiſerunt, & ex juſta ſervitute eos ſolverunt, quaſi *Patres*, qui a morte in vitam illos revocarunt, (13) appellabantur. *Grandi hoc* Beneficio (ſic ab (14) *Ulpiano* dictum eſt) à Patronâ decoratus *Saturnalis*, grati erga eam animi monumentum fecit, & marmore, omne ævum duraturo, merentiſſimas ejus laudes celebravit.

Plate 12. *A Roman Inſcription dug in the North of* England, *with Remarks, by Dr.* Hunter *n.* 354. *p.* 701.

XXXIV. 1. The Inſcription (*Fig.* 2.) was dug up two Years ago in the *Roman Caſtrum* near *Lancheſter*; 'tis very legible, wherefore a ſearch after the firſt fortifying the Place may not be unneceſſary; being able to find the time of *Gordian*'s repairing this Fortreſs to A. C. 243. We may aſcribe its Foundation to the prudent Adminiſtration of *Julius Agricola*, about 169 Years before. I begin my Enquiry with *Veſpaſian*'s firſt Appearance in *Britain*.

A. D. 44. the *Romans* invaded *Britain*, under the Command of *A. Plautius*, in which Expedition *Veſpaſian*, then Legate of the ſecond Legion, made a glorious Figure, having been in 30 Battles, and reduc'd two powerful Provinces, above 20 Towns, and the Iſle of *Wight*. All theſe Succeſſes could not frighten the Natives into ſubmiſſion, till *A.D.* 70. *Veſpaſian* then on the Throne, reſolv'd to puſh on his Conqueſts in *Britain*, and conſtituted *Julius Agricola*, Legate of the XXth Legion, who bore a conſiderable ſhare in the Succeſſes againſt the *Brigantes*; (15) "Sed "primo *Cerealis* modò labores & diſcrimina, mox & gloriam communi-"cabat: Sæpe parti Exercitûs in experimentum, aliquando majoribus "copiis ex eventu præfecit. *Tacitus* afterwards in a few Words ſums up the Whole of *Cerealis* his Acquſitions, (16) "Terrorem ſtatim intulit "*Petilius Cerealis*, *Brigantum* Civitatem, quæ numeroſiſſima Provinciæ "totius perhibetur, aggreſſus; multa prælia, & aliquando non incruen-"ta; magnamque *Brigantum* partem aut victoriâ amplexus, aut bello.

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(8) V. *Camdeni Britanniam* Anglice, p. 570, a Cl. *Gibſono* editam. (9) V. eandem, p. 602. Iterumq; p. 852. (10) V. *Juſti Lipſii* Tractatum peculiarem, [*De Nominibus veterum Romanorum*] Cap. II. (11) D. de diverſis Regulis Juris. L. 106. (12) D. de Fideicom. Libert. Leg. 39. (13) Lexicon Juridicum *Joh. Calvini*; voce *Liberti*. (14) D. de Bonis Libertorum, Leg. 1. (15) *Tacit. Vit. Agric.* 8. (16) Cap. 17.

Notwithſtanding theſe Advantages, I dare not ſuppoſe the *Romans* to have then penetrated ſo far into this Province as our *Longovicum*, which is ſituate ſo near the Northern Bounds of the *Brigantes*, that at preſent it's not diſtant above twelve Miles from *Corbridge*, the Roman *Curia*, the chief Town of the adjoining People the *Otadini*. I now advance to my principal Motive, to fix upon the ſecond Year of *Julius Agricola*'s Government for this Work, which *Tacitus* * thus deſcribes, "Sed ubi Æſtas advenit, contracto Exercitu—loca Caſtris ipſe capere, æſtuaria ac ſylvas ipſe prætentare: & nihil interim apud Hoſtes quietum pati, quo minus ſubitis Excurſibus popularetur; atque ubi ſatis terruerat, parcendo rurſus irritamenta Pacis oſtentare. Quibus rebus multæ Civitates, quæ in illum diem ex æquo egerant, datis Obſidibus iram poſuere, & Præſidiis Caſtelliſque circumdatæ, tantâ ratione curâque, ut nulla antè Britanniæ nova pars illaceſſita tranſierit. This excellent Conduct *Tacitus* further confirms from the Obſervation of Others. "Adnotabant periti, non alium Ducem Opportunitates locorum ſapientius legiſſe, nullum ab *Agricolâ* poſitum Caſtellum aut vi Hoſtium expugnatum, aut pactione aut fugâ deſertum.

* Cap. 20.

Agricola, this Summer, having quieted ſo large a Tract, and finiſhed ſo many Fortreſſes, it cannot be expected all would be built with the moſt exquiſite Art, ſufficient to perpetuate them. I proceed to *Gordian*'s Repairs; whoſe Hiſtorian *Julius Capitolinus* having never once named *Britain*, yet giving ſo many Hints of the excellent Oeconomy of his Government, under the prudent Adminiſtration of his Father-in-Law *Miſitheus*, I dare not fix this Work till the third Year of his Reign: He having before been under the Direction of the Eunuchs and Officers of the Court, whom *Capitolinus* repreſents, in *Miſitheus* his Letter to *Gordian*, to have proſtituted all Employments to their own Covetouſneſs and mercenary Creatures.

Farther Remarks, by Roger Gale, *Eſq*; *n.* 357 *p.* 823.

2. I ſhall not in the leaſt diſpute or call in queſtion the Time of its Foundation, as fix'd by the Doctor, but begin with the Place where it was diſcover'd, namely *Langcheſter* or *Lancaſter*, in the Biſhoprick of *Durham*, which I am, [a] with Dr. *Hunter*, fully perſuaded was the *Longovicus*, where the *Notitia Imperii* places the [b] *Numerus Longovicariorum*. This place is ſeated upon a great Military Way, about 12 Miles diſtance from *Bincheſter*, and ſeven from *Ebcheſter*, the one the *Vinovia*, and the other the *Vindomera* of *Antoninus*, as the Correſpondence of the Numbers may evince; *Bincheſter* being 19 *Roman* Miles from *Ebceſter*, as that is nine from *Corbridge*, the exact Numbers the *Itinerary* gives us between *Vinovia*, *Vindomora*, and *Corſtopitum*. What is very ſtrange is, that the *Itinerary*, which muſt go upon the great Road directly thro' this Town of *Longovicus* betwixt *Vindomora* and *Vinovia*, takes not the leaſt Notice of it, but meaſures the Way at the whole

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[a] *Philoſoph. Tranſ.* No. 266. *p.* 657. Abr. Vol. III. p. 426. [b] Not. Imp. fol. 176.

Length and Number of Miles, from the firſt to the latter of thoſe Stations. If *Longovicus* was founded, as Dr. *Hunter* ſuppoſes, ſo early as the Time of *Julius Agricola*, and if that *Itinerary* was compoſed by any of the Emperors that bore the Name of *Antoninus*, this Station might have been deſtroy'd or deſerted during the Wars with the *Britains*, and not being repair'd till the Reign of *Gordian* III. was paſs'd over by the Author of the Itinerary, as a Camp not then in being, or of no uſe to the *Roman* Armies; and this would be no weak Argument for the Antiquity of that work: And perhaps ſome Parts of it may have been deſcribed as early as the Reigns of thoſe Emperors, or earlier, and ſuch Names of more modern Places as are found in it, may have been afterwards added as Occaſion required. As a farther Confirmation of this Conjecture, I beg leave to obſerve, that this Place, after it was repair'd by *Gordian*, ſubſiſted even to the Ruine of the *Roman* Empire in *Britain*, as is evident by the Mention of it in the *Notitia Imperii*; ſo that had this [d] Journey which carries us from *Vindomora* to *Vinovia* been compos'd after the Reign of *Gordian*, it would be very hard to account for the Omiſſion of this remarkable Station and Town, as it appears to have been from this, and many other Inſcriptions found there.

Having this opportunity of doing it, I am unwilling to let it ſlip without rectifying a Miſtake in the *Eſſay towards the Recovery of the* Roman *Highways thro'* Britain, printed *in the 6th Volume of Mr.* Hearne's Itinerary *of* Leland [e], which having brought the *Ermingſtreet* (not the *Watlingſtreet*, as Dr. *Hunter* and the Country call it) a little beyond *Cattarick* in *Yorkſhire*, divides it there into two Branches, tracing one of them to *Tinmouth*, and the other to *Carliſle*, but omits the main Stemm of it, that runs almoſt directly Northward to *Piercebridge*, ſo to *Denton*, *Houghton*, *Cincheſter*, *Langcheſter*, *Ebcheſter*, *Corbridge*, and through the Heart of *Northumberland* into *Scotland*, about a Mile and a half to the Weſt of *Berwick*. It is in ſeveral places very intire and fair, eſpecially between *Corbridge* and *Bincheſter*, the Ridge of it there being for the moſt part two Yards in Height above the Level of the Soil, no leſs than eight Yards broad, and all pav'd with Stones, that are as even as if new laid: as I am inform'd by the ingenious Mr. *Warburton*, who has often view'd it.

Having fix'd the Seat of this *Longovicus*, where the Inſcription was found, let us conſider next what ſort of a Place it was; and upon due Enquiry it will appear to have been one of the moſt ancient and eminent Stations the *Romans* were poſſeſs'd of in theſe Parts. As to its Antiquity, Dr. *Hunter* has made it probable, that we ought to look for it as high as *Julius Agricola*'s commanding under *Domitian*, in this Iſland: As to its Eminency, the Inſcription that came laſt from him to the Society, as

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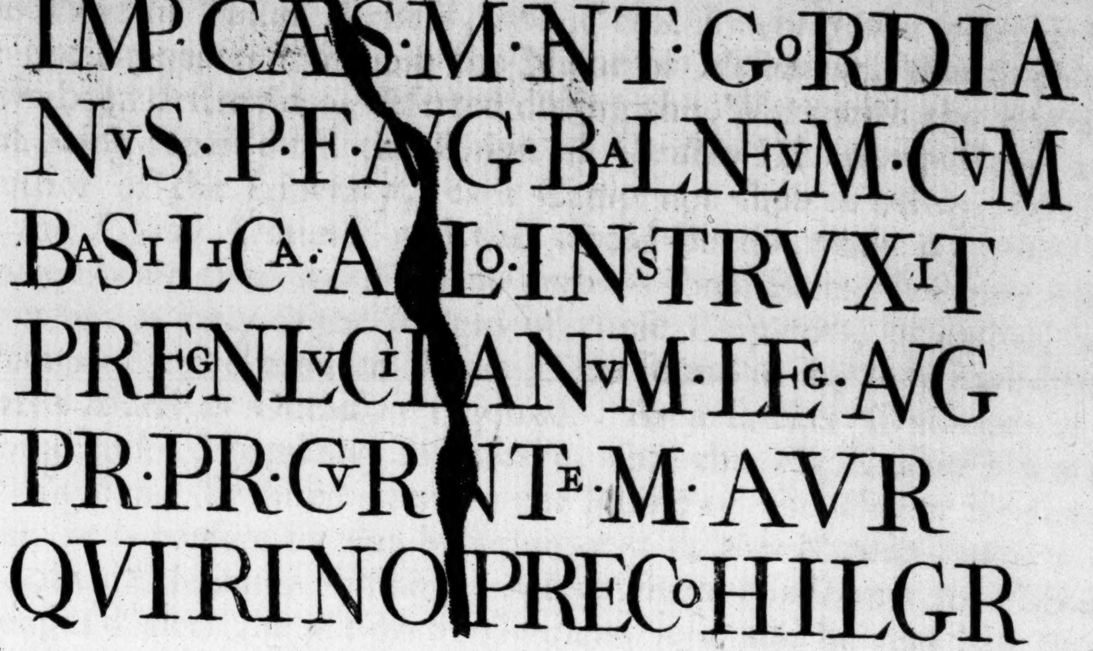
[c] *Ph. Tranſ.* No. 354. p. 702. v. ſupr. p. [d] Iter. I. a Limite Prætor. uſq; [e] P. 111, 114.

well

I.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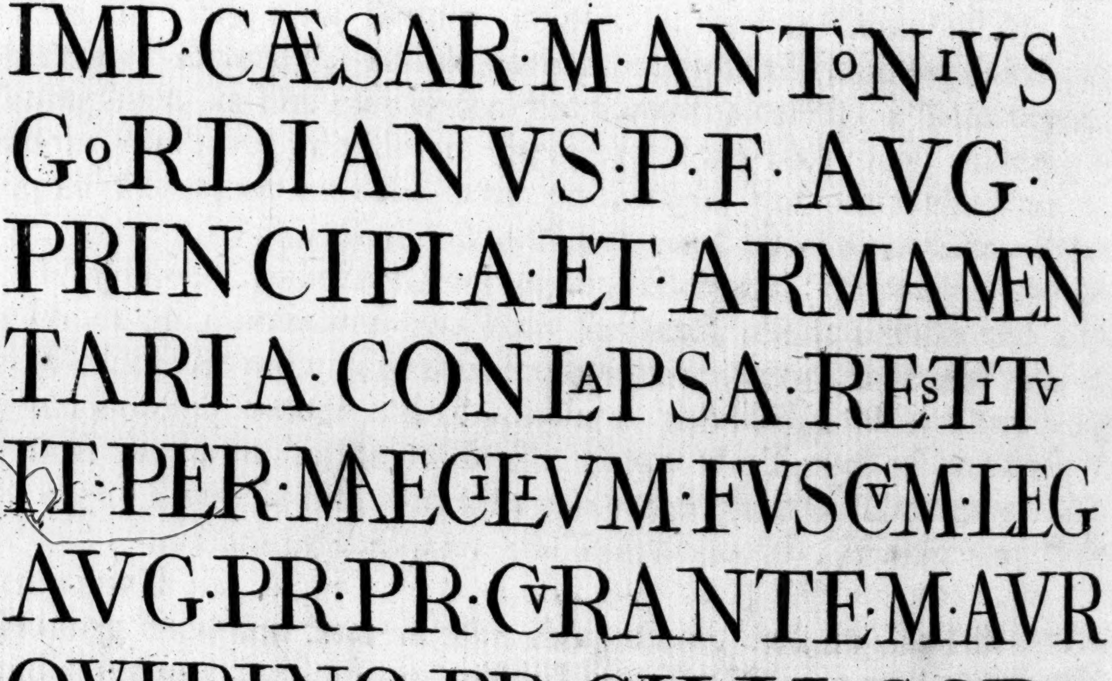
QVIRINO PRECOHILGR

II.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GORDIANVS·P·F·AVG·
PRINCIPIA·ET·ARMAMEN
TARIA·CONLAPSA·RESTITV
IT·PER·MAECILIVM·FVSCVM·LEG
AVG·PR·PR·CVRANTE·M·AVR
QVIRINO·PR·COH·I·L·GOR·

well as ſeveral others found there, is an undeniable Evidence of its being a Place of great Conſideration; but nothing can put that more out of Diſpute than the firſt which was ſome Years ago tranſmitted by the ſame Hand [f], which therefore I beg leave to inſert here with that which came laſt from him, and the rather becauſe little or nothing has ever been ſaid upon it, and that they will give great Light one to the other.

The Stone whereon the firſt is cut has been broke in two, whereby ſome of the Letters are defaced, however, it may be very well read as follows; the Letters PRE in the fourth Line I take to be a Miſtake of the Workman, having ſeen ſeveral Copies, where they are ſo tranſcribed; that they ſhould be PER is evident from the fifth Line of the ſecond Inſcription.

I. *Imperator Cæſar Marcus Antoninus Gordianus* Plate 13.
Pius Felix Auguſtus Balneum cum
Baſilica à ſolo inſtruxit
Per Cneium Lucilianum Legatum Auguſtalem
Proprætorem Curante Marco Aurelio
Quirino Præfecto cohortis primæ Longovicariorum; or rather
Legionis Gordianæ.

The ſecond can be read only after the following manner.

II. *Imperator Cæſar Marcus Antonius*
Gordianus Pius Felix Auguſtus
Principia & Armamentaria
Conlapſa reſtituit
Per Mæcilium Fuſcum Legatum
Auguſtalem Proprætorem curante Marco Aurelio
Quirino Præfecto Cohortis primæ Legionis Gordianæ.

From theſe two Inſcriptions compar'd together, it will be apparent that they were not only erected under the ſame Emperor, but by the Care of the very ſame Perſon *Aurelius Quirinus*, tho' not in the ſame Year. The Emperor can be no other than *Gordianus* the youngeſt, or third of that Name; the two former having been ſlain ſo very ſoon after they had aſſumed the Purple, that it is improbable they ſhould have given any Orders or Commands for the erecting of new, and repairing of ancient Buildings, in ſo remote a Province as *Britain* was from *Africa*, where they were murder'd after a ſhort joint Reign of ſcarce ſeven Weeks.

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[f] Phil. Tranſ. No. 266. Abr. Vol. III. p. 426.

[g] Dr. *Hunter* tells us, that that which was firſt diſcover'd (and which I ſhall therefore always diſtinguiſh by the Name of the firſt) was dug up about a hundred Yards Eaſt from a great Square, which had been fortified with a thick, ſtrong Wall, faced with hewen Stone, within which, and without, eſpecially towards the Eaſt, are nothing but ruinous Heaps of Stone, and thinks the Lodging of the Garriſon only to have been included within thoſe Walls. His Conjecture is very much confirmed by the [h] Account he gives us of the finding the laſt Inſcription within that ſquare Incloſure; ſo that there ſeems to have been at this *Longovicus* a large Town, and one of thoſe Camps call'd *Caſtra ſtativa*, where the Legions lay in Quarters during the time of Peace and Quiet.

The firſt Inſcription tells us, that the Emperor *Gordian* built the *Balneum* and *Baſilica* from the Ground, *à Solo*; whereas, by the ſecond he appears to have been only the Repairer of the *Principia* and *Armamentaria*. Perhaps therefore here might be no Town, till the *Romans* thought fit to repair their old deſerted Camp at this Place, and then the Emperor might alſo build the *Bath* and Palace for the Reſidence of the *Proprætor*, when in theſe Parts of *Britain*; the Word *Baſilica* importing both a Palace, and an Edifice for hearing of Cauſes, and tranſacting all publick Affairs. As this eminent Building was erected by the Emperor's Command, it is an undeniable Argument of the Splendor of this Town, as are the great Heaps of Rubbiſh, and Ruines, where this Inſcription was found, of its Largeneſs and Extent.

The ſecond equally puts the being of the *Caſtrum ſtativum* out of diſpute, when it acquaints us with the Rebuilding of the *Armamentaria* and *Principia* there, that is the *Arcenals* and *Quarters* either of the Legionary Soldiers, that were call'd the *Principes*, or the place where the Eagles and other military Enſigns were kept. It is probable they did not belong to one particular Legion, but to ſeveral, as they had occaſion to be employ'd here; [i] tho' the *Legio ſexta Victrix* ſeems to have the beſt Title to them, as being conſtantly quarter'd in the North; whereas, the [k] *Legio Secunda*, and [l] *Viceſima* were generally garriſon'd, the firſt at *Caerleon* in *Wales* and *Richborrow* in *Kent*, and the other at and about *Cheſter*; ſo that the [m] Monuments they have left in the North were erected by them, when the Wars, and other Works, as particularly the *Walls* carry'd croſs the Iſland, call'd them thither; which being finiſh'd, they returned home to their more Southern Quarters, and continu'd in them till commanded abroad upon new Services. I will not pretend to determine when theſe *Armamentaria* and *Principia* firſt fell to ruin: perhaps it might be when *Hadrian*, *Lollius Urbicus* and *Severus* had carried their Conqueſts farther into the Enemies Country, and having built thoſe famous *Walls*, the Relicks of which we ſtill ſee in the Shire of *Sterling* in *Scotland*, and in *Northumberland* and *Cumberland* in *England*, that this Camp might be thought uſeleſs the *Roman* Forces being drawn nearer to, and quarter'd upon the Frontiers; and ſo this Fortreſs abandoned and ſuffer'd to fall into decay, as the Word *conlapſa* implies: and not that it was deſtroy'd by any Fire, War, or other Enemy than Age and Neglect.

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[g] *Phil. Tranſ.* No. 266. *p.* 658. [h] *Phil. Tranſ.* No. 354. [i] *Ptol. Leg.* VI. *Niceph. Ebor. locat.* [k] *Anton. Itin.* XII. *Not. Imp. p.* 161. [l] *Anton. Itin.* II. [m] *Camd. p.* 835, 920. *Phil. Tranſ.* No. 260.

Tho' the Word *conlapſa* is wrote here with an *N*, there can be no doubt but the Pronunciation of it was as we uſually find it ſpelt, *collapſa*; a certain Argument of the Letter *N*'s being ſilent in the middle of a Word, before two Conſonants eſpecially NS, and NT, when the T was pronounced like an S. To omit what [n] *Quintilian* ſays to this purpoſe, it is confirm'd by the Abſence of that Letter in numberleſs Inſcriptions in *Gruter*, *Reineſius*, *&c.* and no wonder, ſince the Workmen in thoſe Days, as well as ours, uſually wrote as they ſpoke their Words. I ſhall not trouble you with Quotations of any of them to this end, but as a Proof of what I ſay, only aſſure you from ocular Inſpection and a moſt accurate Examination, that there is no tranſverſe Line over the Letters ES belonging to the Word FABRI(ıESIS in the Inſcription of IVL VITALI at *Bath*, whatever has been affirm'd to the contrary, but that the Letter N is totally omitted there. You will alſo pardon my Endeavours, before I leave this Subject, to explain a ſhort Inſcription belonging to ſome of our Countrymen, tho' found at *Amerbach* in *Germany*[o], ſince it will be a new Proof of the foregoing Aſſertion.

III.

NYMPHIS ϕ	*Nymphis.*
NϕBRITTON	*Numerus Brittonum*
TRIPVTIEN	*Triputienſis*, or —— *enus*
SVB CVRAϕ	*Sub cura*
M ϕ VLPI	*Marci Ulpii*
MALCHI ϕ	*Malchi*
▷LEG XXII	*Centurionis Leg.* 22.
PRϕPϕFϕ	*Primigeniæ, Piæ, Felicis.*

There is no Difficulty but in the Word TRIPVTIEN, and that will preſently vaniſh if you inſert the Letter N, and read it TRIPVNT, *i.e. Tripontienus* or *Tripontienſis*, the Mutation of the O and V being ſo frequent, that no body is ignorant of it. This will bring you to *Tripontium*[p] or *Dowbridge* in *Northamptonſhire*; tho' that excellent Antiquary Dr. *Battely*[q], in his *Antiquitates Rutupinæ*, would read it RIPVTIEN, and fix'd the Place whence this *Numerus* took its Appellation at *Richburrow* in *Kent*.

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[n] *Quintil. Inſtit.* Lib. I. c. 7. [o] *Gruter*. p. 93. [p] *Antonin. Itin.* VI. [q] p. 21.

But to return where we left the Camp at *Longovicus*, it will be as difficult to aſſign a Reaſon for its being repaired, as it was for its being deſerted; unleſs that the *Proprætors* might judge it adviſable about the Time of *Gordian* III. to fix their Reſidence there, and conſequently refortify'd the old Camp for their State and Security. And that it was not refortify'd upon any ſudden Emergency, but for Time and Duration, is evident both from the ſtrong Stone-Works that encompaſs'd it, and a Body of Forces lying here, even at the Expiration of the *Roman* Empire and Authority in this Iſland, which from its Continuance in the ſame Station, had got the Name of the *Longovicarii*[r]. The Perſon that under the Emperor gave Direction for theſe Repairs, was *Mæcilius Fuſcus*: As *Mæcilius* is a Diminutive of *Mæcius*, it is not unlikely that he was the Son of *Mæcius Fuſcus*, who was Conſul with *Turpilius Dexter*, *A. D.* 225. in the Reign of *Alexander Severus*: By this Inſcription it appears that this *Mæcilius* was the Emperor *Gordian*'s *Lieutenant* here and *Proprætor*; For tho' in *Phil. Tranſact.* No. 354, by the Inadvertency of the *Engraver*, we read only PR. inſtead of PR. PR; it is right in the Original, and in the Tranſcript ſent up by Dr. *Hunter*, and accordingly afterwards the Fault is amended. And as the Name of *Fuſcus* ſtands in the ſame Place in the ſecond as that of *Lucilianus* does in the firſt, and with the ſame Adjuncts both before and after, we may fairly conclude he was either his Predeceſſor or Succeſſor, but which, it is impoſſible to determine.

And here, perhaps, it may not be amiſs to remark, we never meet with a *Legatus Auguſtalis* in any Inſcription in this Iſland, without the joint Title of *Proprætor*; and [s] *Tacitus* himſelf either makes them the ſame Office, or at leaſt unites them in the ſame Perſon, when he tells us, *In Britanniâ P. Oſtorium Proprætorem turbidæ res excepere*; and having preſently after related the manner of the Fight with the *Iceni*, ſtyles him *Legatus*, *Quâ pugnâ filius Legati, M. Oſtorius, ſervati civis decus meruit*[t]; and a little after he gives both the ſame Titles to *A. Didius* the Succeſſor of *Oſtorius*.

We are indebted therefore to theſe two Monuments, not only for the Account they have preſerved of the *Roman* Arms and Magnificence at *Longovicus*, but for the indiſputable Records of the Names of two *Legates* and *Proprætors* of *Britain*, that would otherwiſe have been buried in Oblivion, *viz. Cneius Lucilianus* and *Mæcilius Fuſcus*: For from *Virius Lupus* (who was *Proprætor* and *Legate* here about the Year 208, under *Severus*, and juſt before that Emperor's coming into this Iſland repaired a Bath burnt down at *Lavatræ*, or *Bowes*[v], in *Yorkſhire*) we have no where extant the Name of one of thoſe Officers, till we come to *Nonnius Philippus*, whom I take to have ſucceeded the laſt of theſe; the [w] Stone which was found at *Old Carliſle* in *Cumberland*, and has preſerv'd his Memory, ſetting forth that he was *Legate* and *Proprætor* when *Atticus* and *Prætextatus* were *Conſuls*, which was *A. D.* 242. the very Year that our *Gordian* went upon his *Perſian* Expedition, from which he never return'd. And as that Emperor left *Nonnius Philippus* in that Poſt, when he march'd into the Eaſt, where he was murder'd about two Years after, it is highly probable that he was the laſt *Proprætor* of his appointing, and conſequently, that *Mæcilius Fuſcus* was his Predeceſſor, and the Repairs begun at *Longovicus* before the Year 243 [x]. I would not have troubled you with this Inſcription, but that it is faultily tranſcribed in *Camden*, and that I ſhall have occaſion by-and-by to refer to it again, upon a material Point.

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[r] *Notit. Imp.* fol. 176. b. [s] *Tac. Lib.* Ann. 12. c. 32. [t] Ibid. c. 39. [v] *Camd.* p. 762. Edit. 1695. [w] *Camd. Britan.* p. 830.

IV. I. O. M.
PRO. SALVTE. IMPERATORIS
M. ANTONI. GORDIANI. P. F.
INVICTI. AVG. ET. SABINAE. FvR
IE. TRANQVILE. CONIVGI. EIVS. TO
TAQVE. DOMV. DIVIN. EORVM. A
LA. AVG. GORDIA. OB VIRTVTEM
APPELLAT. POSVIT. CVI. PRAEEST
AIMILIVS. CRISPINVS. PREF
EQQ. NATVS. IN. PRO. AFRICA DE
TVSDRO. SVB. CVR. NONNII. PHI
LIPPI. LEG. AVG. PROPRETO.
ATTICO. ET. PRETEXTATO COSS.

The Perſon who had the Care of theſe Repairs both in Town and Camp, was *Marcus Aurelius Quirinus*, *Præfect* or *Commander* of a Company of Foot; another Argument for the Proprætors *Lucilianus* and *Fuſcus* ſucceeding immediately one the other, he ſerving in the ſame Poſt under both. I muſt obſerve however, that altho' the two firſt Inſcriptions have been cut very near the ſame time, and by the ſame Hand, as appears by the Form of the Letters, and Manner of the Abbreviations in each of them, yet the Office that this *Quirinus* bore is ſomething differently expreſs'd in the firſt from what it is in the ſecond, if they have been accurately tranſcribed; the Firſt ſhewing, after *QUIRINO* the Letters PRE. CoH. I. LG. R, which, before I had ſeen the Latter, I was induced to read *Præfecto Cohortis primæ Longovicariorum*, the [y] *Notitia Imperii* placing the *Præfectus numeri Longovicariorum Longovico*. That *Numerus* and *Cohors* were the ſame thing, [z] *Pancirollus*, in his Notes upon that Book, quotes St. *Chryſoſtome* to prove, and ſome others, *Cohors erat qui vocatur Numerus*; but I rather take it to be an indefinite Number of Men, which might comprize ſeveral Companies, independent of any Legion. [a] *Vegetius*, ſpeaking of the *Legati Imperatoris*, ſays, *in quorum*

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[x] *Phil. Tranſ.* No. 354. p. 702. v. ſupra. [y] Fol. 166. b [z] Fol. 161. b [a] Lib. II. c. 9.

locum nunc illuſtres viros conſtat Magiſtros Militum ſubſtitutos, à quibus non tantum binæ Legiones, ſed plures Numeri gubernantur; by which it is plain, the *Numeri* were no *Legionary Cohorts*. Neither was the Name ſo modern as from the *Notitia Imperii* and *Chryſoſtome* it might appear to be; for we meet with a [b] *Numerus Britonum* upon an Altar found in *Tranſylvania*, dedicated to the *Nymphs*, when the Emperor *Commodus* and *Glabrio* were Conſuls, *A. D.* 186. And [c] another *Numerus* upon an Altar erected to *Hercules* for the Proſperity of *Septimius Severus*, when *Lateranus* and *Rufinus* were Conſuls, *A. D.* 197. But after I had review'd the Letters at the end of the ſecond Inſcription, which are plainly tranſcribed PR. CoH. I. L. GOR. I could read them no otherwiſe than *Præfecto Cohortis primæ Legionis Gordianæ*. *Gordian* III. was ſo beloved of the Soldiery, that ſeveral Legions complemented him by honouring themſelves with his Name, as the [d] *Legio tertia Italica*, which took the Addition of *Gordiana*; and the [e] *Legio decima gemina*, and [f] *Decima tertia gemina* did both give themſelves the ſame Appellation. But which of the Legions quartered in this Iſland ſo ſtiled it ſelf is not determin'd by this Inſcription or any other that I know of. However as the *Legio ſexta Victrix* was all along quarter'd in the Northern Parts of this Kingdom (as I obſerved before) where theſe Inſcriptions were erected, I make no doubt but it was that which call'd it ſelf *Gordiana*, tho' the numeral Diſtinction of VI is omitted, only perhaps for want of Room on the Stone. We find by ſeveral Inſcriptions in *Camden*, that there was an *Ala* in thoſe Parts which prided it ſelf upon its Valour, and was therefore call'd the *Ala Auguſta*; of the many Memorials it has left us of its Title, I ſhall only mention [g] one found at *Old Carliſle*, and which is the ancienteſt of them all, by any certainty of Date.

I. O. M.
AL. AVG. OB
. . . RTVT. APPEL. CVI
PRAEEST. TIB. CL. TIB. F. P.
LING · · N. IVSTINVS.
PRAEF. FVSCIANO.
II. SILANO. II. COS.

That is, *Jovi Optimo Maximo, Ala Auguſta ob Virtutem appellata, cui præeſt Tiberius Claudius Tiberii filius, provinciâ Lingonenſi, Juſtinus præfectus, Fuſciano ſecundò, Silano ſecundò Conſulibus.*

This Altar was dedicated when *Fuſcianus* and *Silanus* were the ſecond time *Conſuls*, that is, in the Year 188. under the Reign of *Commodus*, and fifty Years before our *Gordian* came to the Empire. At the ſame place was alſo diſcover'd the fourth Inſcription by me quoted, where we find this ſame *Ala Auguſta* ſtiling it ſelf alſo *Gordiana*; from whence I think it is not a little probable that the Legion to which this Wing appertain'd was the *Legio Gordiana* mention'd in the Inſcriptions found at *Langcheſter*; and that Legion to have been the *Legio ſexta Victrix*, from the long Continuation of this *Ala Auguſta* in theſe Northern Parts of the Nation, the conſtant Quarters of that Legion.

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[b] *Gruter.* p. 94. 2. [c] Id. 46. 9. [d] *Velſ. Monum. Auguſtæ Vindel.* p. 431. [e] *Grut.* p. 80. [f] Gruter. p. 433. 1. [g] *Camd.* p. 827.

XXXV. 1. The following Fragment of an old Inſcription is to be ſeen on the *Wall*, about two Miles Weſt from *Lenercroſs-Abby*, near the Confines of our two Northermoſt Counties.

An old Roman Inſcription, by Dr. Jurin. *n.* 356. *p.* 813.

CIVITATE CAT
VVILLAVA'
ORVM· L· O[S
CD!O`

2. Here 'tis obſervable, that the laſt A of the ſecond Line has a Mark that follows it, not unlike to the laſt Stroak of an *N*; and if inſtead of A! we put *N*, we ſhall read it CIVITATE CATVVILLAVNORUM, which we cannot doubt to have been the true Name of that People which *Dion. Caſſius, Lib.* LX. calls Καλȣελλανοὶ, and *Ptolemy*, in his Geography, *Lib.* II. *cap.* 3. more falſly, Καλυευχλανοὶ; the firſt λ by producing the tranſverſe Stroke having been miſtaken for χ. This Nation appears by *Dion* to have been more potent than their Neighbours the *Dobuni* (whom he calls *Boduni*) and had, according to *Ptolemy*, *Verolamium* for their Capital, which, 'tis moſt probable, was the *Caſſivellauni oppidum* of *Cæſar*. So that it ſhould ſeem *Caſſivellaunus* King of theſe *Catuvillauni* when *Cæſar* invaded *Britain*, either gave his Name to his People, or took theirs. But he was no doubt the moſt potent Prince at that time in *Britain*, ſince by common Conſent of the reſt, he was made General of their united Forces, in defence of their Country's Cauſe againſt the *Romans*.

Remarks, by ib. p. 814.

XXXVI. 1. A Perſon laſt Week being at Plow in a Cloſe near the Bank of the River *Usk*, which the Ancients called *Iſca*, (which glides by us about a quarter of a Mile off and in ſight of *Caerleon*) came thwart a Stone, and finding Letters thereon, took it up whole; 'tis about a Yard in length, and about three Quarters broad. I went to the place, and took a true Copy thereof, as follows. There was underneath it ſome ſeeming Oblong Square Sepulcher of Stones, rude in order. A little further in that Cloſe, where that River wears out the Land, there was, ſome time before, a large Earthern Pot taken out of the Bank by the River-ſide, which had therein the Scull and Bones of ſome Perſon, by ſome

A Roman Inſcription, by Mr. Rice. *n.* 359. *p.* 945.

ſome thought to be a Child murther'd; But I rather conjecture it a *Roman* Urn.

D M
G. VALERIVS. G. F.
GALERIA. VICTOR
LVGDVNI. SIG. LEG. II AVG
STIP. XVII. ANNOR XLV. CV
RA. AGINT. AMNIO. PERPITVO. B

Remarks, by Dr. Harris. *ib. p.* 946.

2. This ancient and fair Inſcription confirms what others have found hereabouts; and what *Camden* and other Hiſtorians ſhew us, *viz.* That the ſecond *Roman* Legion called *Auguſta*, brought into *Britain* by *Claudius Cæſar* under the Conduct of *Veſpaſian*, was placed here by *Iſca* or *Caer Legion*, by *Julius Frontinus*, in order to awe the *Silures:* And that General obtained ſeveral Victories over them and their Neighbours in ſeveral Places hereabouts.

There ſeems to be nothing of moment or of difficulty in this Inſcription; but *Victor Lugduni:* Which as I think we have no ground from Hiſtory to refer to *Lyons* in *France*, ſo I gueſs that Expreſſion may be thus accounted for. The River *Lugg* is famous in the Neighbouring Parts; and as *Dynas* or *Dyn* hath been ſaid to ſignifie a Town in the Ancient *Britiſh* Language; and that *Dun* doth alſo ſerve to expreſs a Hill or *Down* as we ſtill call it; (which I think is derived from the *Britiſh* alſo) probably *Lugduni* here may expreſs ſome Town or Hill near the River *Lugg*; and ſince there is a Place called to this Day *Luckton*, on the ſide of the River *Lugg* in *Herefordſhire*, perhaps that may bid fair to be the very place where *Valerius* obtained the Victory perpetuated by this Inſcription.

Antiquities in Lincolnſhire, *communicated by Mr.* Thoreſby. *n.* 279. *p.* 1158.

XXXVII. 1. Near the River *Welland*, that runs thro' the Town of *Spalding* in *Lincolnſhire*, at the depth of above eight or ten Foot, there were found *Jettys*, as they call them, to keep up the old Rivers Bank, and the head of a Tunnel that emptied the Land-water into the old River; and at a conſiderable diſtance from the preſent River, I gueſs 20 or 30 Yards, there were dug up (about the like depth) ſeveral old *Boats*, which things ſhew that anciently the River was either much wider than now it is, or ran in another place, or both. On the other *viz.* the North-Weſt ſide of the River, and more upwards in the

Town, were digg'd up (at about the aforementioned depth) the remains of old *Tanvats* or *Pits*, a great quantity of *Ox Horns*, and the Shoe-ſoles, which I told you of, and I think the very Tanners knobs, *&c.* which things ſhew, that the ſurface of the Country lay anciently much lower than now it does, and has been raiſed by the Seas throwing in its Sand in the Maritime Parts (now moſt inhabited) and by the *Moor* or *rotted Sedge* in the fenny parts next the high Country; the whole Level is about 50 Miles in length, and 30 Miles over in the broadeſt parts. No Record (Printed or MS) or Tradition whatſoever, (that I ever heard of) tell us when theſe Mutations here diſcoverable happened.

One thing further I will add, that lately at the laying of the preſent new Sluice or Goat (as they call it) at the end of *Hamorebeck*, at its fall into *Boſton* Haven, taking up the Foundation of the old Goat, they met with the *Roots of Trees*, many of them iſſuing from their ſeveral *Boles* or *Trunks*, ſpread in the Ground, which when they had taken up (Roots and Earth they grew in) they met with a ſolid Gravelly and Stony Soil of the high Country kind, (but black and diſcoloured by the change that had befallen it) upon which hard Earth they laid the Foundation of this new Goat. Where theſe Roots were dug up, was certainly the ſurface of the old Country, the certain depth whereof I cannot now tell you, but that it was much deeper than that at *Spalding*, as the Land is there at preſent higher. The *Archimedean* Screw, or Screw-like Trunk or Cylinder, by which the Workmen cleared themſelves of Water was very pretty.

A farther Account of the ſame. ib. 1156.

2. A Workman being about to fence in a Hay-ſtack, and digging a grip for that purpoſe about the depth of half a Yard, ſtruck his Spade upon a Pot, which when he broke, (elſe nothing could be got out of it) there was no leſs than 36 pound weight of old *Roman* Copper Coin found in it. The Pieces were found ſet in rows edgeways one by another, and ſtuck ſo together with the Verdigreaſe or Ruſt of Copper, that many of them required a Chizel or ſome ſuch thing to ſeparate them; but being ſeparated, clean'd and brighten'd, the Heads or Figures of all or moſt of them were very fair, (ſome as when newly ſtamped,) and the Inſcriptions of many are very legible. Here was amaſs'd together a great variety of Coins in this Pot. The place where they were found is in the midſt of the vaſteſt Flat or Level in *England*, and in a Ground that, for many Ages paſt, uſed to be cover'd with Water in the Winter, and overgrown with Reed in the Summer. 'Tis about a Mile and a half South by Weſt from *Fleet Church*, and about as far South by Eaſt from *Holbeach*. There are no Banks or Hillocks, old Works or Ruins to be ſeen near it; nor any remains or tokens of any thing extraordinary to have been there; (but the old Sea Bank about two or three Mile off; which *Dugdale* from a paſſage in *Tacitus* believes to be caſt up by the *Roman* Soldiers.) But all is as flat as the Sea, and a low

Country, producing a coarſe flaggy Graſs for the moſt part round about it.

Swediſh *Coins, by Mr.* Thoreſby. *n.* 297. *p.* 1901.

XXXVIII. I have a *Swediſh Coin*, or rather a ſquare Copper Plate, 9 Inches broad, and 9 and an half long, which is much like the *Roman Æs grave*, and was currant there ſo lately as *An.* 1679. (tho' now they are not to be met with) It has at each corner the Impreſſion of a Crown, under which is the Year, and round it this Inſcription, CAROLUS XI. D. G. SVE. GOT. WAN. REX. and in the middle of the Plate in a Circle 2 DALER. SöIH. Mījt. The other ſide of the Plate is without any Inſcription. Several of the Modern Chriſtian Princes of thoſe Northern Countries, have inſcribed the *Nomen Tetragrammaton* of our Almighty *Jehovah* on ſome of their Monies: I have *een Svenska marc* of *Charles* the 9th with it, ſurrounded with rays of Glory in the midſt of the *Area* on the Reverſe, and a Mark, half Mark, and a two Mark-piece all of the famous *Guſtavus Adolphus*, with the like Characters above the King's Head.

Norman *Coins at* York, *by the ſame. n.* 303 *p.* 2127.

XXXIX. Mr. *Samuel Buxton* deſigning to build upon a Piece of Ground he had bought in *High Ouſegate* in *York* City, had Labourers to remove the Rubbiſh of a former Houſe; which, with about thirty more, was burnt down *April* 3. 1694. In digging below the Foundations of the former Houſe, at a conſiderable depth they diſcovered the more ancient Foundations of an old Fabrick, very probably unknown to the Builders of the later Houſe. Theſe lower Foundations were very well ſupported at ſeveral Angles with good Oak Piles, ſome of which were ſo firm and ſound, that they were good again for the ſame purpoſe; beſides theſe Piles, there were ſeveral great Timber-trees, that lay athwart, to make the ſtronger Foundation: Betwixt the head of two Piles in this lower Foundation, the Workmen found a little decay'd *Oak-box*, wherein had been hoarded about 200 or 300 Pieces of *Norman Coins*; but age and the moiſture of the place had ſo defaced them, that not above 100 of them could be preſerved: Through the Gentleman's kindneſs I had the peruſal of about half that number, which proved the nobleſt ſtock that ever I ſaw, or indeed heard of, of *William the Conqueror's* Coins; not above two or three in the whole Cargo that I ſaw being of any other Prince: Thoſe, tho' later in time, are more rare in value than many of the *Roman* and *Saxon Coins*: theſe lower Foundations alſo very well anſwer the account we have of the *Timber-buildings* in thoſe Ages. The Coins are very much alike; the King is repreſented full-faced, with a Crown and Labels, but neither Scepter, Croſs or Star, as in other Moneys of his that I had before; moſt of them are inſcribed *WILLEMV REX*, which ſome have miſtaken for *William the IId*; but by the declining of the ſtrokes, it appears to be deſign'd for *V*, as I have one with the *S* after the *V* and before *REX*. By this accident there appears greater variety, than ever was known before, of the *Conqueror*'s Money, thro' the kindneſs of Mr. *Buxton* and others. I have of theſe ſorts, *WILLEMV REX. WILLEMVS REX. WILLEMV REX I.* (which is not to be reckoned a Numeral Letter, it being improper to pretend a diſtinction, when there was none of the Name before, but for part of the Letter *A*) *WILEM REX A.* (*Angliæ.*) And for the Reverſe I have that were coin'd at *LUNDRE.* (*London.*) *EOFERwick.* (*York.*) *WINC* (*Wincheſter.*) *EXETE* (*Exeter.*) *LIN* (*Lincoln*, I preſume, *Lyn-Regis* not being old enough.) *LINCOL* (*Lincoln.*) *DEOTFORND* (*Thetford.*) and *LOYNC* (which I take for *Loyn* or *Lancaſter*). I have only one duplicate, which I preſent to you, and hope you will find it ſafe in the Seal of the Letter; 'tis inſcribed ✠ *WILLEMV REX I.* Reverſe ✠ *DEII. IRD ON LIN.*

Roman ones, by the ſame. n. 303. p. 2149.

XL. They were dug up at the Eaſt Entrance of *Clifton* (a Village on the Cliff of the Hill) three Miles from *Doncaſter*, the *Roman Danum*, where the *Præfectus Equitum Criſpianorum* reſided, and one from *Cunsbroagh* or *Coningsburgh*, an ancient Seat of the Kings during the *Saxon* Heptarchy, now belonging to Mr. *Cook* of *Norfolk*. They were found ſo near a Highway, that the Cart-tracks had worn the Earth off the top of the *Urn*, which a Labourer of Mr. *Moleſworth*'s ſtruck his Pick-Ax into, before he was aware of it: Upon another ſearch they found another *Theca Nummaria*, both full of Copper Coins; the haſte and ſcramble of the Workmen made them break in pieces both the Urns, which were large and entire; the bigger of them might contain two Gallons: By the Fragments of them they appear to have been of a finer Clay than thoſe found at * *South Holland* in *Lincolnſhire*, and the Coins alſo much better preſerved, being in a drier Soil. Of 60 I bought of thoſe found at *Fleet* Com. *Linc.* there was not one before *Gallienus*, nor after *Quintillus*; and of near 150 of theſe from *Clifton*, there is not one of an elder, or later date; ſo that both thoſe in *Holland* and theſe in *Yorkſhire*, ſeem to have been hid in ſome common Calamity that followed the Death of that ſhort-liv'd Emperor *Quintillus*, who reigned but ſeventeen Days, *An. Dom.* 271. And within ſix Years after, we find that *Probus* the Emperor, upon ſome Commotions in *Britain*, ſent over certain *Vandals* and *Burgundians*, who had invaded *Gaul*, to inhabit *Britain*; upon whoſe arrival, probably ſuch as had made the Inſurrection, might conceal their Treaſure; and being ſlain in the Conflict, it lay hid till now. This I look upon as a more probable Conjecture, than the Perſecution of *Diocleſian*, which was not till thirty four Years after. Theſe, tho' they have not added one Emperor to my Collection, yet have they made a very conſiderable addition to the Variety of Reverſes; ſo that I have above thirty of *Gallienus*. I ſhall only preſent you with a Liſt of ſuch as were found at *Clifton*. So far as are in Capital Letters are upon the Coins, the reſt are only for explanation.

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* *Phil. Tranſ. n.* 279. *p.* 1156. *ſup. p.* 129.

Reverſes of *Gallienus*. SECVRITas PERPETua. PAX AVGuſti. APOLLINI CONServatori AVGuſti. PVDICitia. LAETITIA. AEQVITAS AVG. AETERNITAS AVG.

LIBEro Patri CONS. AVG. DIANAE CONS. AVG. MARTI PACIFERO. .....P. VII. COS. (Pietas libans) ....S. STATOR; which I take for *Mars*, who is ſometimes ſo ſtiled as well as *Jupiter*. VICTORIA AETERna. CONCORdia.

Salonina. Reverſe VESTA.

Poſthumus. PAX AVG. P. M. TRP. COS. V. which I take to be remarkable, having not met with any more than the fourth Conſulſhip.

Victorinus. INVICTUS *(typus Solis vel Apollinis)* VIRTVS AVG. PAX. AVG. SALVS AVG. PIETAS AVG.

Tetricus the Father. SALVS AVG. PAX. AVG. HILARITAS AVG. VICTORIA AVG. FIDES MILITVM. LAETITIA AVG. SPES PVBLICA. COMES. VIRTVS AVG. COMES AVG.

Tetricus Cæſar. SPES PVBLICA. SPES AVGG. PIETAS AVGGuſtorum.

Claudius. GENIVS EXERCI. LIBERALITAS AVG. VIRTVS AVG. VICTORIA AVG. PAX AVG. FELICITas TEMPoris. AEQVITAS AVG. IOVI VICTORI.

Quintillus. PROVIDENTIA AVG. VIRTVS AVG.

Others, by the ſame. n. 316. *p.* 134.
* *Phil. Tranſ. n.*282. *n.*1288. *ſupr. p.* 49.

XLI. In *April* 1718, ſome *Roman* Coins were plow'd up in *Cookridge* in *Yorkſhire*, and are a confirmation of the Conjecture of the late * *Thomas Kirk*, Eſq; that the *Roman Via Vicinalis* (which comes from the great military Road upon *Bramham Moor*) paſs'd from the Station at *Adelocum* thro' theſe Grounds to *Ilkley*.

There are but few of them but thoſe moſtly very fair; The eldeſt is of *Domitian*, A. U. C. 846. or A. C. 95. His Head is ſurrounded with this Inſcription, IMPerator CAESar DOMITianus AVGuſtus GERManicus P. M. (Pontifex Maximus) T R. P. (Tribunitia Poteſtate) XIIII. The Reverſe ſhews he was then ſaluted Emperor the 22d time, IMP. XXII. COS (Conſul) XVI CENS. PP. (Pater Patriæ,) the *Flavian* Family particularly affected the Title of *Cenſors*, and *Domitian* is the laſt Emperor who has that Title upon his Medals; the Figure upon this Reverſe has a Helmet upon the Head, and a Spear in the Right Hand.

The next is of *Nerva*'s,

IMP. NERVA. CAES. AUG. PM. TRP. COS. Reverſe CONCORDIA EXERCITVVM. Dextræ junctæ.

The next Seven are of *Trajan*'s, but all different,

IMP. CAES. NERVA. TRAIANVS. GERM. Rev. PM. TRP. COS. III. PP. figura ſtolata ſtans, ſiniſtra cornucopiæ.

The next has the ſame Inſcription, ſave that it was in his 4th Conſulſhip, and has *figura galeata cum haſta.*

IMP. TRAIANO. AUG. GER. DAC. PM. TRP. Rev. COS. V PP. SPQR. (Senatus Populuſque Romanus) OPTIMO PRINCipi. Pacis ſtantis typus, dextra facem admoventis ſpoliis, ea conflagaturus, ſiniſtra cornucopiæ tenentis. (exurge) PAX.

IMP. CAES. NER. TRAIANO. OPTIMO. AVG. GER. DACico. Rev. PM. TRP. COS. VI. PP. SPQR. Deus Genius ſtans, dextra pateram.

IMP. TRAIANVS. AVG. GER. DAC. PM. TRP. Rev. COS. VI. SPQR. OPTIMO. PRINC. fig. ſtolata.

IMP. TRAIANO. OPTIMO. AVG. GER. DAC. PM. TR. PP. Rev. COS. VI. PP. SPQR. figura ſtolata dextera Caduceum, ſiniſtra Cornucopiæ.

IMP. TRAIANO. AVG. GER. DAC. PM. TRP. COS. VI. P.P. Rev. SPQR. OPTIMO. PRINCIPI. Columna cochlidis *Trajani.*

The reſt that are legible, are of *Hadrian*'s, *viz.*

HADRIANVS. AVGVSTVS. Rev. COS. III. Victoria cum Palma.

The other has upon the Reverſe,

FELICITATI. AVGVSTI. Above the *Navis Prætoria*, and below it COS. III. PP.

Theſe are all of Silver: There was a large one of Copper of the Emperor *Domitian*,

IMP. CAES. DOMIT. AVG. GERM. . . . . but the Reverſe was not legible.

John Dyneley of *Bramhope* Eſq; has alſo three, one with FIDES EXERCITVVM, one of *Titus*'s, and one of *Trajan*'s, with *Dacia* Captive under a Trophy, but I want the Inſcription; all the reſt are in the Poſſeſſion of *Cyril Arthington* of *Arthington* Eſq; the Lord of the Mannor, who obliged me with one, for Lecturing upon the reſt, the Figure whereof I ſend you, it being upon a remarkable Occaſion, and not mentioned in *Occo* (at leaſt in my Edition of that Author;) 'tis inſcribed HADRIANVS AVG. COS. III. PP. Rev. RESTITVTORI HISPANIÆ. This was upon his peaceable ſettling of Affairs in that his Native Country; *Spain* is repreſented here as a Woman with a Branch in her Right Hand to denote her Fruitfulneſs, kneeling before the Emperor, who kindly takes her by the Hand to raiſe her up. *Plate 12. Fig. 3.*

By theſe it appears this Station flouriſh'd, when the *Roman* Empire was in its prime, and there being none of a later date, makes it probable, that it periſh'd in ſome of the Inſurrections of the native Brigantes, as it was conjectur'd from the Form of the Letter A in the Inſcriptions on the Funeral Monuments formerly accounted for.

XLII. *Accounts of Books omitted.*

n.302.p.1101. 1. Νεκροκηδεία: Or the Art of Embalming. Part I. With a Map and fourteen Sculptures, by *Thomas Greenhill*, Surgeon. 4*to. Lond.* 1705.

n.337.p.283. 2. Julii Vitalis Epitaphium: cum Notis Criticis Explicationeq; V.C. *Hen. Dodwelli* & Commentario *Gul. Muſgrave*, M. D. *Iſcæ Dunmon.* 1711.

n.344.p.304. 3. Ducatus Leodienſis: Or the Topography of the Town and Pariſh of *Leedes*, and Places adjacent in the County of *York*, by *Ralph Thoresby*, Eſq; *Fol. Lond.* 1715.

n.346.p.385. 4. Geta Britannicus. Accedit Domus Severianæ Synopſis Chronologica, & de Icuncula quondam M. Regis Alfredi Diſſertatio, 8*vo. Iſcæ Dunmon.* 1715. Auctore *Gul. Muſgrave*, M. D. R. S. S.

n.349.p.502. 5. Diſſertatio de Dea ſalute; In qua illius Symbola, Templa, Statuæ, Nummi, Inſcriptiones exhibentur, illuſtrantur. Auctore *Gul. Muſgrave*, G.F. *Oxon.* 1716.

n.300.p.2012. 6. Olaui Rudbeckii Atlanticæ, ſive Manhemii pars Secunda. In qua ſolis, Lunæ & Terræ cultus deſcribuntur, omniſq; adeo Superſtitionis hujuſce Origo, parti Sueoniæ Septentrionali, Terræ puta Cimmeriorum, vindicatur, ex qua deinceps in orbem reliquum divulgata eſt, &c. Accedunt Demonſtrationes certiſſimæ, quæ Septentrionales noſtros, in maxime genuinum Solis ac Lunæ motum, indeq; pendentem accuratiſſimam temporum rationem, multo & prius & felicius quam gentem aliam ullam penetraſſe declarant. Upſalæ. *Folio.*

n.301.p.2057. 7. Ejuſdem Pars Tertia. In qua vetuſtiſſima majorum noſtrorum Atlantidum lapidibus, fago, æri, ſive cortici Runas ſuas incidendi ratio, unà cum tempore, quo illa primum cœperit, exponitur. Necnon aurei numeri ſingulis annis tributi, & ſignorum Cœleſtium, quæ abhinc ad Græcos & Latinos ſunt tranſlata, vera origo & ſignificatio traditur. Et illæ a diluvio Noachi primæ ætates, atq; in illis prima Atlantidum noſtrorum forma, deſcribuntur: quæ migrationes & bella, ſub Boreo ſeu Saturno ejuſq; filio Thoro ſeu Jove, geſta recenſentur: & deniq; Scytharum Phœnicum & Amazonum, his ducibus in Indo-Scythiam ſeu Phœniciam ſeu Palæſtinam è Sueonia factæ expeditiones enarrantur. Quibus omnibus Mythologiæ perplures, quarum ſenſus in hunc uſq; diem incognitus hic demum detectus prodit, jucundæ ſane & perquam utiles adjunguntur. Upſalæ. *Fol.* 1698.

CHAP. II.

Voyages and Travels.

Obſervations in Shropſhire, *by Mr.* Plaxton, *com. by Mr.* Thoresby. *n.* 310. *p.* 2418.

I. ANno 1673, I was preſented to the Vicarage of *Sheriffe-Hales*, and alſo to the Rectory of *Kinnardſey*, the former in the Counties of *Salop* and *Staffordſhire*; The other wholly in *Shropſhire*. *Nov.* 6. I was inducted into the Parſonage of *Kinnardſey*, where I was Incumbent for thirty Years and upwards; at my Induction I found a great many *Aged People* in the Pariſh, upon which I took the Number of the Inhabitants, and found that *every ſixth Soul was ſixty Years of Age*, and upwards, ſome were eighty five and ſome ninety; this I could not but wonder at, conſidering that the Town was ſurrounded with a large Moraſs, overflowed in Winter, and that you could not come into the Pariſh any way upon Arable Land. At my Entrance there, I found neither *Gentleman* nor *Beggar*, nor any ſort of *Diſſenter* from the Church; there had been no *Law Suit* amongſt them in the Memory of Man, nor was any commenced during my Incumbency as Rector there for above thirty Years together; they have but *one way to the Town and Pariſh*, the reſt they hire from Lords of the adjacent Manors. The *Moraſſes* or *Moors* are of great extent, and the Pariſh was ſurrounded with them, the Village was called *Kinnardſey* or *Kinnardus his Iſland*; *ei*, *ea*, *ey*, all theſe are watry Terminations: Thus the next Pariſh was *Eyton*, the Town upon the Waters, *Edney*, or *Edwyney*, *Edwin*'s Iſland, *Buttery*, or *Butterey*, the Iſland of Butter, being a long grazing Tract of Land, with ſome others of the like ending. All that vaſt Moraſs was called, the *Weald-Moor*, or the Wild Moor, that is, the Woody Moor: Thus the *Wood-Lands* of *Kent* are called the *Weald* of *Kent*; the *Wolds* of *Yorkſhire* moſt probably have been Woody formerly, and called the *Wealds*, for the word *Weald* or *Wold* is by our *Saxon* Maſters render'd *Woody*; and I have been aſſured from aged People, that all the Wild Moors were formerly ſo far overgrown by Rubbiſh Wood, ſuch as Alders, Willoughs, Salleys, Thorns, and the like, that the Inhabitants commonly hang'd Bells about the Necks of their Cows, that they might the more eaſily find them. Theſe Moors ſeem to be nothing elſe but a Compoſition of ſuch Sludge and Refuſe as the Floods left upon the Surface of the Ground, when they drain'd away, and yet this Sediment is full three or four Foot thick; for I have often obſerved, that the Black Soil caſt up by Moles, or digged out of the Ditches, was a meer Compoſition of Roots, Leaves, Fibres, Spray of Wood, ſuch as the Water had brought, and left behind it; in digging they often find Roots and Stumps of Oaks three or four Foot under the Surface, and they are very common in the bottom of their Ditches and Drains: The Soil is peaty, and cut up for Fewel in ſome part of the

Lordſhip; in the bottom of theſe Peat Pits, they find Clay, Sand, and other ſorts of Earth. Theſe Grounds have been formerly much higher, for I have obſerved Oaks and other Trees, where the preſent Soil is ſo much ſhrunk and ſettled from them, that they ſtand upon high Stilts, and are ſupported from the great Fibres of the Roots, ſo that Sheep may eaſily creep under them.

That great Tract, called formerly *Vaſta Regalis*, is now by Draining become good Paſtorage, and yields my Lord *Gower*, the Owner of it, a conſiderable Rent, his Anceſtors having purchaſed the Royalty from one of the Earls of *Shrewsbury*: It yields great Quantities of *Hay*, tho' much of it is of ſuch a nature, that it will dry up a new Milch-Cow, ſtarve an Horſe, yet will it feed an Oxe to admiration; and I have heard ſome Graſiers ſay, they could not by their beſt Upland Hay feed an Oxe ſo fat, as the Moor-Hay would do; this, I ſuppoſe, proceeded from its dry and binding Quality that made the Oxen drink much.

One thing I muſt further obſerve to you. Within the Pariſh, about half a Mile from the Church, there is a pretty Farm call'd, *The Wall*, which I judge was formerly a *Britiſh Fortification*; 'tis encompaſſed with a Moraſs, and raiſed up from Sand, broken Stones, Gravel, and Rubbiſh to a great height and breadth, being (as I meaſured it) above 1900 Yards in compaſs, and 16, 18, and 20 Yards in breadth: In ſome places it ſeems to have been built before the Moors became boggy, for I could never find any way over the Moors, by which they could carry thoſe vaſt Quantities of Earth, Clay, Sand and Rubbiſh to raiſe that mighty Rampire. In that Pariſh I was the *ſixth Rector* from the Days of *Henry* VIII.

As to my Rectory of *Donington*, to which I was preſented *Anno* 1690, I found there as many *Old People* as I did at *Kinnardſey*, nay, I may ſay more; and in the two Pariſhes I had but a difference of three in the Number of the People; at *Kinnardſey* I had 135 Souls, at *Donington* 138; of the 135 I had 23 aged 60 and upwards, of the 138, 24; both which Numbers multiplied by 6, the one at *Kinnardſey* was 138, the other at *Donington* would have been 144. I had nothing very remarkable at *Donington*, ſave the *Royal Oak*, which ſtood at *Boſcobel* within the Pariſh, and the Owners thereof paid 6*s.* 6*d.* yearly, in lieu of their Tythes and Offerings: The *Royal Oak* was a fair ſpread thriving Tree, the Boughs of it were all lined and covered with Ivy; here in the Thick of theſe Boughs the King ſat in the Day-time with Colonel *Carleſs*, and in the Night lodged in *Boſcobel-Houſe*, ſo that they are ſtrangely miſtaken, who judged it an old hollow Oak, whereas it was a gay and flouriſhing Tree, ſurrounded with a great many more; and as I remember in Mr. *Evelyn's* Hiſtory of Medals, you have one of King *James* I. or King *Charles* I. where there is a fine ſpread Oak with this Epigraph, *Seris Nepotibus Umbra*; which I leave to your Thoughts. The People here live to *great Ages*; I ſaw in one Houſe three healthful People, whoſe Ages numbered together made 278, and I think they lived ſome Years after; they were the Man and his Wife, and his Wife's Brother.

I was at *Donington* about thirteen Years and ſome Months; in all that time I buried but twenty ſeven People, of which Number four came from Neighbouring Pariſhes, four were young ones, and of the remaining nineteen, the youngeſt was about ſixty, and the eldeſt ninety ſix Years of Age. I was there the fourth legal Incumbent in Succeſſion from the *Reformation*; and as I remember at one Triennial Viſitation of the Biſhop, we had neither Burial or Wedding to return into the Regiſtry at *Litchfield*: The Country is very healthful in thoſe Parts, and tho' it ſeems to the Eye of a Traveller to be but of a moderate height, yet in riding between *Donington* and *Wolver-Hampton*, which is but five Miles, you croſs four Rills or Brooks in the compaſs of three Miles, two of which run into the South-Weſt Seas, *viz.* to *Severn* and *Briſtol*, the other two haſten to *Trent* and *Humber*, and ſo into the Northern Ocean. The poor Remains of the *Royal Oak* are now fenced in by an handſome Brick-Wall, at the Charge of *Bazil Fitz-Herbert* Eſq; with this Inſcription over the Gate, (upon a Blue Stone) in Golden Letters.

Fœliciſſimam Arborem quam in Aſylum
Potentiſſimi Regis Caroli Secundi Deus Opt. Max.
per quem Reges Regnant, hic creſcere
voluit, tam in perpetuam rei tantæ
Memoriam, quam in Specimen Firmæ
in Regis fidei, Muro cinctam
Poſteris Commendant, Bazillius
& Jana Fitz-Herbert.
Quercus Amica Jovi.

'Twas put up about twenty or thirty Years ago, but the Place deſerved a nobler Memorial; I have writ it in ſuch Lines as they have cut it, and as the Letters now ſtand; a few Years will ruin both the Wall and the Inſcription.

The Emblematick Medal my good Friend alludes to, is the XLVI^th^ in Mr. *Evelyn*'s *Numiſmata*, which King *Charles* I. cauſed to be ſtamped in honour of the Inſtallation of his Son, whereupon is the *Royal Oak* under a Prince's Coronet, overſpreading Subnaſcent Trees and young Suckers.

SERIS. FACTURA. NEPOTIBUS. UMBRA.

Reverſe within the Garter of the Order is this Legend.

CAROL. M. B. REGIS FILIUS. CAROL. PRINC. INAUGURATUR XXII. MAII. MDCXXXIIX.

The Inſcription at *Boſcobel* reminds me of one I had from the late Reverend Mr. *Illingworth*, Preſident of *Emanuel* College, *Cambridge*, which was inſcrib'd on a Pillar erected by the Sea ſide.

Siſte, viator, iter; veſtigia prima ſecundus
Poſuit hic Carolus, *quum redit exilio.*

Obſervables in Wales, *by* Mr. Edw. Lhwyd. *n.* 334. *p.* 462.

II. 1. I ſearched diligently in *Snowdon* Hills for figured Stones; but met with none at all, except cubical Marchaſites, and Cryſtals, whereof I found one about nine Inches long, and thicker than my Wriſt, tranſparent as Glaſs for the better half, but opaque towards the Root like white Marble. Some ſmall ones I met with of the colour of a Topaz; and was inform'd of others purely Amethyſtine, found in the Valley of *Nant Phrantcon*. I find our Anceſtors (for want of more precious Stones) made themſelves Beads of Opaque, or Marble Cryſtal; for I have one given me, cut like a Lottery-ball, and perforated; found not long ſince in *Meirionydhſhire*. I deſire to know whether you are ſatisfy'd, that thoſe tranſparent Stones figured by Dr. *Plot*, and by Dr. * *Liſter*, by the name of *Ombriæ*, &c. are ſo form'd naturally. One of them was lately given me (ſet in Copper with a little Handle to it) by the name of *Tlŵs Owen Kyveiliog*, i. e. *Owen* of *Kyveiliog*'s Jewel; ſo call'd, becauſe found in an old *Crigg* or *Barrow*, near the Place where he lived.

* Phil. Tranſ. *n.* 201. *p.* 778. Abr. Vol. II. *p.* 466.

Sir *William Williams* hath ſeveral *Welſh* MSS. (tho' I think no Dictionary.) They are chiefly modern Copies out of *Hengwrt* Study in *Meirionydhſhire*, which I am promis'd free acceſs to; and have this time taken a Catalogue of all the ancient MSS. it contains. They are the Works of *Taliesſyn*, *Aneuryn gwawdydh*, *Myrdhyn ab Morvryn*, and *Kygodio*, *Elaeth*, who lived in the fifth and ſixth Centuries (but the ſmall MS. containing them all ſeems to have been copied about 500 Years ago) as alſo of ſeveral others valuable in their kind.

We have neither the *Ibex* nor *Rupicapra* in *Wales*, nor any other Goat but the common. In our Language the Park Deer is call'd *Geivr Danas*: The former word ſignifies *Goats*, but whether the latter part implies *Daniſh* (as if Deer had come from *Denmark*) or ſomewhat elſe we know not.

The Grey Game (tho' I have not heard of the name) ſeems to be the Female of the Black; which we call *Gryg-ieir*, i. e. *Gallinæ ericetorum*. The Red Game we call *ieir y mynydh*, i. e. *Gallinulæ montanæ*; becauſe in our Country they keep to the higheſt Hills, or Alps, [in Welſh *banneu*,] eſpecially if heathy. There came this laſt *May* into *Cardiganſhire* two ſtrange Birds (as I gueſs by the Deſcription given them) of the Aquatic fiſſiped Tribe. They ſay they were almoſt two Yards tall, and of a whitiſh colour, with the Tips of their Wings dark: I took 'em to be ſome ſort of Exotic Crane. This time two Years, there came a

Flock of Birds [about a hundred] to a Hemp-yard, at a place called *Lhan Dhewi Velfrey* in *Pembrokeſhire*; and in one Afternoon deſtroyed all the Hempſeed. They were extraordinary tame; or ſo intent on their Food, that being forc'd from the Food, they would not remove above two or three Yards. The Cocks were of a deep Scarlet Colour, without any diſtinction in the Feathers of their Wings, except that the Tail and the lower part of the Belly were a little paler. The Hen had a lovely Scarlet Breaſt, her Head and Back grey.

Our Lakes (tho' they are very numerous) afford no Fiſh that I can hear of, beſides Trout and Eel, and *Torgoch* and *Gwiniad*, i. e. Shelley and Charre. A Fiſherman proteſted to me, that in a Lake called *Lhyn y Cwn* near *Lhan Berys*, he had ſeveral times catch'd Monocular Trouts, ſomewhat diſtorted or contracted awry. They farther aſſured me, that the two higheſt Lakes of *Snowdon (Phynnon Vrêch* and *Phynnon lâs)* afford no Fiſh at all; and that the Trouts of the other Lakes differ in colour: But theſe things muſt, and ſhall (God willing) be better inquired into.

There is no Brimſtone or Pumice-ſtones on the Tops of our Mountains, nor any thing elſe that I ſuſpect to have been the Effects of Vulcano's. What ſeemed to me moſt ſtrange, were waſte confus'd Stones, and (to appearance) fragments of Rocks, ſtanding on the Surface of the Earth, not only in wide Plains, but on the Summits alſo of the higheſt Mountains. I have never ſeen any Lake or Spring on the Summit of a Hill. There are indeed on the tops of ſome Hills, where ſtood anciently Caſtles or Forts, certain Wells called in Welſh *Pydew*; a Word of the ſame Signification as well as ſound with the Latin *Puteus:* But no Water runs out of theſe; and ſeveral of them I found quite dry.

I ſaw ſome new *Species* of *Gloſſopetræ* and *Siliquaſtra* (the firſt *Ichthyodontes*, I ſuppoſe, that ever were obſerv'd in *Wales)* on the top of a high Mountain called *Blorens* near *Aber Gavenni*. The *Siliquaſtra* were ſmaller than the generality of thoſe I had obſerv'd in other Countries. Of the *Gloſſopetræ* we found one pretty large; but the reſt very ſmall; all black, or atrorubent. The ſame place afforded alſo ſome variety of Foſſil Shells, and plenty of *Cuthbert*'s Beads, which were very ſmall in compariſon of what are found throughout the North of *England*. We alſo found there a large Teſtaceous Body, not to be compar'd as to its Figure with any ſort of Shell yet deſcrib'd: Together with ſome emboſſed Repreſentations of pieces of the Sceletons of Eels, or ſome leſſer Fiſh. All theſe were in Limeſtone; but advancing about three Miles further into *Brecknockſhire*, at a place call'd *Lhan Elhi* we ſearched ſome Coal and Iron Mines. Their Coalworks were not Pits ſunk like Draw-wells; but great Inroads made into the ſide of the Hill, ſo that three or four Horſemen might ride in abreaſt. The Top is ſupported with Pillars left at certain diſtances; and they make their By-lanes (as in other Pits) as the Vein requires. The Slat above this Coal afforded only Stalks of Plants, which we did not

ib. p. 467.

ſave,

ſave, becauſe it ſeem'd impoſſible to reduce them to their ſeveral proper *Species*. However, cloſe by the Pit we found a Stone for ſubſtance like thoſe they make Lime of; of a compreſs'd Cylinder Form; and as it were cut off even at each end: About eight Inches long, and three
* Hiſt. Ox. c. 5. p. 55. in breadth: Its *Superficies* adorn'd with equidiſtant Dimples, like Dr. * *Plot*'s *Lepidotes*, and in each Dimple a ſmall Circle; and in the Center of each Circle a little Stud like a Pin's head. This is the only Curioſity of the kind I have ſeen; and is not referable to any thing I can think of either in the Animal or Vegetable Kingdom. Among the Iron Oars of the ſame Hills we found ſome new Spars, and ſeveral Specimens of Oars ſhot into a conſtant and regular Figure, tho' not reducible to any Animal or Vegetable Bodies.

About five Miles thence, at a place call'd *Pont y Pwl* in this County (where, as alſo at *Lhan Elhi*, there are Furnaces and Forges) we found more Coal and Iron Mines; and collected ſome fair Repreſentations of the Leaves of Capillary Plants on the Iron Oar, but found no Branches. One Major *Hanbury* of this *Pont y Pool*, ſhew'd us an excellent Invention of his own, for driving hot Iron (by the help of a rolling Engine mov'd by Water) into as thin Plates as Tin: But without a Draught of the Machine I cannot give you a Notion of it. They cut their common Iron Bars into Pieces of about two Foot long; and heating them glowing hot, place them betwixt theſe Iron Rollers; not a-croſs, but their Ends lying the ſame way as the Ends of the Rollers. The Rollers (mov'd with Water) drive out theſe Bars to ſuch thin Plates, that their Breadth, which was about four Inches, becomes their Length, being extended to about four Foot; and what was before the Length of the Bars is now the Breadth of the Plates. With theſe Plates he makes Furnaces, Pots, Kettles, Sauce-Pans, *&c.* Theſe he can afford at a very cheap rate, (about the third part of what is uſual) and yet dares warrant them not leſs ſerviceable.

n. 335. p. 500. I copy'd out in *Glamorganſhire* a large *Welſh* MS. wrote on Vellum about 300 Years ſince: It contain'd a Collection of the oldeſt Writers mention'd by Dr. *Davies*, at the end of the *Welſh* Dictionary: We have ſince found two or three Plants, which I had never met with before; *viz.* 1. *Lyſimachia Chamænerion dicta Alpina C. B. Prodr.* 2. *Bifolium minimum.* 3. *Solanifolia Circæa Alpina C. B.* 4. Mr. *Ray*'s *Alſine ſpuria puſilla repens foliis Saxifragæ aureæ*. We found indeed the firſt alſo laſt Year at *Hyſvaè*, one of the Hills of *Snowdon*. Dr. *Richardſon* brought it home with him laſt Year, and it flowring ſince in his Garden, he is fully ſatisfy'd it is diſtinct from the common *French* Willow-Herb.

In a ſteep Rock called *Craig y park*, and others in the Pariſh of *Yſtrad Dyvodog*, we obſerved divers Veins of Coal, expoſed to ſight as naked as the Rock; and found a Flint Axe, ſomewhat like thoſe uſed by the *Americans*. At *Goldoliff* in *Monmouthſhire* we had ſome variety of form'd Stones: But what pleaſed me moſt was an *Aſteria*, or Column Star-Stone, beſet with Sprigs the whole length of it, iſſuing from the Commiſſures of the Plates. This County abounds with *Entrochi*; one whereof I ſaw in a Rock at the Iſle of *Barry*, about fifteen Inches in length; and another about ten Inches long, but as thick as a Cane. We took their Figures and Dimenſions, but could not get off the Stones without breaking.

At *Kaer phily* Caſtle the People ſhewed us an Inſcription (as they ſuppoſed) on one of the Steps of the Tower; a Copy whereof I here ſend you. I muſt confeſs I am not fully ſatisfied whether it were ever deſigned for reading, or for ſome kind of antique Ornament; but rather incline to the latter. The Stone was not deſign'd for a Step, there being none of the ſame kind in the whole Stair-caſe. The Marks were moſtly worn out by treading; and it is poſſible they might be once more uniform; and ſome few Miſtakes may have happened in the copying it as it is. I have ſent the Stone to the *Muſéum* at *Oxford*; where the Curious may be ſatisfied. Were it the old *Celtic* Character, which *Cæſar* ſays was like the *Greek*, 'twere a noble Diſcovery: But I fear our Anceſtors (if ever they had any Writing) have left us none upon Stones.

n. 337. p. 93.

At *Kàpel Kirig* I found plenty of the *Biſtorta*, and the *Naſturtium petræum* of *Johnſon*, and I think a new Plant in the ſmall Lake of *Phynnon Urêch*, where the *Subularia* grew. I met with ſeveral rare Plants in other Places; as *Echium marinum* J. B. *Aſparagus ſylveſtr. Eruca marina*; *Eruca ſylveſtris laciniata lutea*; *Dulcamara marina*; *Tithymalus marit. Beta marina*, &c. in *Caernarvonſhire* and *Angleſey:* And in *Meirionydſhire* I found good ſtore of our *Snowdon* Plants at *Kader Idris*, and *Balſamina lutea* in the High Road near a place call'd *Càpel Begla*. In South *Wales* I found ſeveral Plants common, which I had never ſeen in North *Wales*; ſuch as *Eruca ſylveſtris*, common on the Walls of their Towns and Caſtles; *Aſplenium ſ. Ceterach Officin. Centaureum luteum perfoliatum*; *Linum ſylveſtre*; *Fagus*, &c. in *Pembrokeſhire*. I met with two, which I ſuſpect for new, *viz.* a *Tripolium*, and an *Anthyllis leguminoſa ſupina, flore coccineo*.

Amongſt ſeveral others, I found one large Cryſtal above *Phynnon Urêch* about ſeven Inches long, and as thick as my Wriſt. In *Monmouthſhire* I met with large petrified *Vertebræ*, and ſome few form'd Stones in each County: But I employed the greateſt part of my time in copying Inſcriptions, taking Catalogues of *Welſh* MSS. *&c.*

I ſpent three or four Days in the Coal-Pits of the Foreſt of *Dean*, where I found (I think) all your Capillaries, beſides ſome other new Plants, three or four whereof are pretty curious; together with two Species of *Aſtrepodium* gather'd on the *Severn* Shore, the only Rarities of the kind, I ſuppoſe, that have been diſcover'd. I doubt not but (as you ſay) the Coal Plants have been obſerved by the Workmen long ſince, tho' they eſcaped the notice of Naturaliſts, who till this laſt Century contented themſelves with bare reading and ſcribling Paper. I find it well known to all our Country Colliers by the Name of *Carreg Redynog*,

i. e. the Ferny Stone; and one Mr. *Williams*, Archdeacon of *Cardigan*, who is a Perſon very curious and ingenious, told me he had obſerved much finer Patterns twenty five Years ſince in the Coal Pits of *Glamorganſhire* than ſome that I ſhewed him. The Stalks of Fern and Hartſtongue I think we often met with, but cannot ſay we ſaw any Roots. Indeed I know not well whether the Impreſſions of the Stalks might be eaſily diſtinguiſh'd from thoſe of the Roots.

I have found ſeveral of the more ancient *Britiſh* Coins; whereof you ſee divers Figures in *Camden*. My Friend Mr. *Nicholſon* quotes *Cæſar* for the *Britons* having no Coins; whereas on the contrary *Cæſar*'s Words are, *Nummo utuntur parvo & æneo:* Nor can I ſee any reaſon to doubt of *Britiſh* Coins of all ſorts of Metal, till he or ſome other inform whoſe Coins thoſe are which Mr. *Camden* and other Writers take to be *Britiſh*. The Druid Beads are generally Glaſs. I have met with two or three of them, that had a Snake manifeſtly painted round them: So that I take it for granted, the *Ova Anguina* of the *Britiſh* Druids were theſe Glaſs Beads; tho' thoſe of the *Gauliſh* were the Shells of the *Echini orbiculati laticlavii.*

Sept. 1698. We ſearch'd this Summer the high Mountain by *Brecnock* call'd *Y Vann uwch deni*, but found nothing in it new, nor any great variety of rare Plants. The moſt choice were *Sedum Alpinum ericoides*, in abundance; *Argemone lutea*; *Rhodia Radix*; *Muſcus cupreſſiformis*, and about half a dozen more of the common *Snowdon* Plants. *Lyſimachia Chamænerion dicta* is a common Plant (by the Name of *Lhyſie'r Milwr*, i. e. *Herba militaris)* in the Meadows through all the upper Parts of this County. We alſo met with *Sorbus legitima* and *Sorbus torminalis* (grown to as great a height as the *Ornus)* neither of which had ever occur'd before in *Wales*. But of all theſe Topical Plants I was ſurpriſed at none ſo much as the *Capillus Veneris verus* growing very plentifully out of a marly Incruſtation, both at *Barry* Iſland and *Porth Kirig* in *Glamorganſhire*, and out of no other Matter; and alſo that *Gnaphalium majus Americanum* ſhould grow on the Banks of *Rymny* River (which runs altogether over Iron Stone) for the ſpace of at leaſt twelve Miles beginning near the Fountain-head in a Mountain of this County; and yet not a Plant of it to be ſeen elſewhere throughout *Wales*. In a great Lake called *Lhyn Savadhan* I found a pellucid Plant I had never met with before: The Leaves are extraordinary thin and tranſparent, in form not unlike ſmall Dock Leaves; but the middle Rib is continued beyond the extremity, ſo that each Leaf has a ſoft Prickle at the end: By which Note I hope you will be able to tell me what it is. We found there alſo the *Hippuris ſaxea*, and two elegant ſorts of ſmall Leeches, which I ſuppoſe not deſcrib'd.

The Limeſtone of this County affords ſmall *Gloſſopetræ* and *Siliquaſtra*; but they are but very ſcarce in compariſon of the quantity found in *Oxfordſhire*, *Northamptonſhire*, *Berks*, &c. The moſt conſiderable Rarities it affords are *Fayrie Cauſways*, which I call ſo in imitation of their *Giants*

Cauſways in **Ireland**, *ſi licet magnis componere parva:* for whereas theirs may be half a Mile long; ours ſeldom exceed three Foot. Our Lime Quarries yield two or three Bodies congenerous with it, tho' of a very different Form.

2. In the High-Lands we found the People every where civil enough; and had doubtleſs ſped better as to our Enquiries, had we had the Language more perfect. We met with ſeveral Inſcriptions, but none of them *Roman*, nor indeed ancient: However, we copied all we met of two hundred Years ſtanding, &c. for the ſake of the Orthography of the *Iriſh* Names, which are writ differently from what is now uſual. We alſo took Figures of ſome Variety of their *Broaches*, or Silver and Braſs *Fibulæ* uſed by the Women to claſp their *Koleriv*, a Garment anſwering our Nightrails. But what we were moſt diverted with, was their Variety of Amulets; many of which (if not all) were certainly uſed by the Druids, and ſo have been handed down from Parents to Children ever ſince. Some of theſe may be render'd in *Engliſh*, 1. *Snake-button.* 2. *Cock-knee Stone.* 3. *Toad-ſtone.* 4. *Snail-ſtone.* 5. *Mole-ſtone.* 6. *Shower-ſtone*; and 7. *Elf-arrow.*

In Scotland, *p.* 97.

The *Snake-button* is the ſame deſcribed in the Notes on *Denbighſhire* in *Camden*, by the Name of Adder-Beads: But there are of theſe great Variety, as to Colour and Ornament; inſomuch, that betwixt *Wales* and the High-Lands, I have ſeen at leaſt fifty differences of them. In *Ireland*, tho' they are tenacious enough of all old Cuſtoms, I could hear nothing of them: So I conclude, that either the *Iriſh* had no *Druids*, or that their want of Snakes fruſtrated their advancing that Impoſture amongſt the People: But there were but a few Places where we inquired; and perhaps we may hereafter hear of them in other Parts of that Kingdom. Not only the Vulgar, but even Gentlemen of good Education throughout all *Scotland*, are fully perſwaded the Snakes make them, tho' they are as plain Glaſs as any in a Bottle.

The *Cock-knee* Stone is an *Echinites pileatus minor*, of Flint; which they firmly believe to be ſometimes found in the Knees of an old Cock; and a Fellow in *Mul* proteſted to me (tho' I was never the nearer believing him) that he had with his own Hands taken one of them out of a Cock's Knee; and named two or three others, who had done the like.

The *Toadſtone* is ſome Peble, remarkable for its Shape and ſometimes variety of Colours. This is preſumed to prevent the burning of a Houſe, and the ſinking of a Boat: And if a Commander in the Field has one of them about him, he will either be ſure to win the Day, or all his Men ſhall fairly die on the ſpot.

The *Snail-ſtone* is a ſmall hollow Cylinder of blue Glaſs, compoſed of four or five Annulets: So that as to Form and Size it reſembles a midling *Entrochus*. This, amongſt others of its myſterious Virtues, cures Sore Eyes.

The *Mole-ſtones* are Rings of blue Glaſs, annulated as the aforeſaid Snail Stones.

They have the *Ombriæ pellucidæ* (which are Cryſtal Balls, or Hemiſpheres, or depreſſed Ovals) in great eſteem for curing of Cattle; and ſome on *May* Day put them into a Tub of Water, and beſprinkle all their Cattle with that Water, to prevent being Elf-ſtruck, bewitch'd, *&c.* And

As to this *Elf-ſtricking*, their opinion is, that the Fairies (having not much Power themſelves to hurt Animal Bodies) do ſometimes carry away Men in the Air, and furniſhing them with Bows and Arrows, employ them to ſhoot Men, Cattle, *&c.* I doubt not but you have often ſeen of thoſe Arrow-heads they aſcribe to Elfs or Fairies: They are juſt the ſame chip'd Flints the Natives of *New England* head their Arrows with at this Day; and there are alſo ſeveral Stone Hatchets found in this Kingdom, not unlike thoſe of the *Americans*. I never heard of theſe Arrow-heads nor Hatchets in *Wales*; and therefore would gladly be informed whether you have ever heard of their being found in *England*. Theſe Elf Arrow-heads have not been uſed as Amulets above thirty or forty Years; but the uſe of the reſt is immemorial: Whence I gather they were not invented for Charms, but were once uſed in ſhooting here, as they are ſtill in *America*. The moſt curious, as well as the Vulgar throughout this Country, are ſatisfied they often drop out of the Air, being ſhot by Fairies, and relate many Inſtances of it; but for my part I muſt crave leave to ſuſpend my Faith, until I ſee one of them deſcend.

Near *Glaſcow* we found two Foſſils *toto genere* new: One reſembling ſmall Joints of a Lobſter's Arm, but much longer; the other ſomewhat like large *Gloſſopetræ*, or perhaps like the *Mucro* of a *Pinna marina*. Theſe figur'd Stones are found there in an Iron-ſtone, tho' I never ſaw them in that kind of Matter in *Wales*. We found both Shells and *Entrochi* gone off to that Subſtance, having changed their Matter and much of their Shape. Near the ſame Town ſearching for theſe Foſſils, I found in the midſt of the Lime-ſtone ſome *Cochlitæ* compos'd of Flint; but *Conchitæ* of Spar, gone off ſo far from the Shape of Shells, as hardly to be known, were it not from others in the ſame place retaining their Shape more entirely. The Principal of the College ſhew'd us Stones, he had lately procured for the Library, having *Roman* Inſcriptions. Theſe we copied, and ſeveral others elſewhere of the ſame Date. They keep theſe Stones at *Glaſcow* very carefully in the Library; and the Principal was daily expecting two or three more that had been promiſed him.

Mr. *Southerland* gave me Specimens of the *Chamæpericlimenum*, *Adianthum acroſticon*, and *Pyrola Alſines flore Europæa*. I had nothing for him in exchange, but Samples of the *Vitis Idæa foliis Myrtinis criſpis Meretti*, together with ſome of the Berries. This I found plentifully for ſome Miles together in that —— and of *Mul*, next to *Ey Columb Kil.*

'Tis very different from the common *Vitis Idæa ſempervirens fructu rubro*; being of a larger Plant, much more branched; the Leaves of a crips'd Surface, and the Berries (which as they told me it retains all the Year) liker unto thoſe of Holly. Going up one of the high Hills of *Mul* we found *Rhodia Radix*; *Pes Cati*; *Cotyledon hirſut.* *Vaccinia rubra*; *Sedum Alp. trifido folio*; and (which I had never ſeen grow ſpontaneouſly) *Alchimilla Alpina quinquefolia.* We found in this Iſland a curious *Fucus arboreus* with a ruffled Stalk, whereof we took a Figure.

In Ireland, *by the ſame.* ib. p. 503.

3. We continued not above three Days at *Dublin*, when we ſteer'd our Courſe towards the *Giants Cauſway*. The moſt remarkable Curioſity we ſaw by the way, was a ſtately Mount at a place call'd *New Grange* near *Drogheda*; having a number of huge Stones pitch'd on end round about it, and a ſingle one on the top. The Gentleman of the Village (one Mr. *Charles Campbel*) obſerving that under the green Turf this Mount was wholly compoſed of Stones, and having occaſion for ſome, employ'd his Servants to carry off a conſiderable Parcel of them; till they came at laſt to a very broad flat Stone, rudely carved, and placed edgewiſe at the bottom of the Mount. This they diſcover'd to be the Door of the Cave, which had a long Entry leading into it. At the firſt entering we were forc'd to creep; but ſtill as we went on, the Pillars on each ſide of us were higher and higher; and coming into the Cave, we found it about twenty Foot high. In this Cave, on each hand of us was a Cell or Apartment, and another went on ſtraight forward oppoſite to the Entry. In thoſe on each hand was a very broad ſhallow Baſon of Stone, ſituated at the Edge. The Baſon in the right hand Apartment ſtood in another; that on the left hand was ſingle; and in the Apartment ſtraight forward there was none at all. We obſerved that Water dropt into the right hand Baſon, tho' it had rained but little in many days; and ſuſpected that the lower Baſon was intended to preſerve the ſuperfluous Liquor of the upper, (whether this Water were ſacred, or whether it was for Blood in Sacrifice) that none might come to the Ground. The great Pillars round this Cave, ſupporting the Mount, were not at all hewn or wrought; but were ſuch rude Stones as thoſe of *Abury* in *Wiltſhire*, and rather more rude than thoſe of *Stonehenge:* But thoſe about the Baſons, and ſome elſewhere, had ſuch barbarous Sculpture (*viz.* Spiral like a Snake, but without diſtinction of Head and Tail) as the fore-mentioned Stone at the Entry of the Cave. There was no Flagging nor Floor to this Entry nor Cave; but any ſort of looſe Stones every where under Feet. They found ſeveral Bones in the Cave, and part of a Stags (or elſe Elks) Head, and ſome other things, which I omit, becauſe the Labourers differ'd in their Account of them. A Gold Coin of the Emperor *Valentinian*, being found near the top of this Mount, might beſpeak it *Roman*; but that the rude carving at the Entry and in the Cave ſeems to denote it a barbarous Monument. So, the Coin proving it ancienter than any Invaſion of

the *Oſtmans* or *Danes*; and the Carving and rude Sculpture, Barbarous; it ſhould follow, that it was ſome Place of Sacrifice or Burial of the Ancient *Iriſh*.

* *v.* Ph. Tr. *n.* 212. & 241. Abr. Vol. II. *p.* 511. & *ſeq.*

We have the ſame Stone, * as in the *Giants Cauſway*, on the Top of *Cader Iris*, one of the higheſt mountains of North *Wales*; but ours is leſs elegant, and does not at all break off in Joynts; nor could I ſatisfy my ſelf that there are ſet Joynts (as in the *Entrochus* and *Aſteria*) in the *Baſaltes* of *Ireland*; but that it is the Nature of the Stone to break off in ſuch a convex Form. However, we could perceive no Seams in theſe Pillars, excepting on thoſe Sides that were expoſed to the Weather.

Another remarkable Curioſity we met with, was a Copper Trumpet like a Sow-Gelders Horn; having the hole for ſounding near the midſt, and two Rings at the ſmaller End; above two foot long. Three of theſe were found in an old *Karn* (*i. e.* a great heap of Stones) at *Balle Niwr* near *Carreg Fergus*.

* *v. ſup.* Part III. *p.* 229.

We could make nothing of the Petrifying Quality of * *Loch Neach*; but that they ſometimes find Stones there, having the Grain of Wood. We met with ſome *Iriſh* Inſcriptions there, and others here; which none of the Critics in that Language we converſed with could interpret.

Near *Larne* in *Antrim* we met with one *Eoin Agniw*, whoſe Anceſtors had been Hereditary Poets, for many Generations, to the Family of the *O Neals*; but the Lands they held thereby being taken away from his Father, he had forſaken the Muſes and betaken himſelf to the Plow: So we made an eaſy Purchaſe of about a dozen ancient Manuſcripts on Parchment.

N. 336. *p.* 524.

I have in divers Parts of the Kingdom pick'd up about 20 or 30 *Iriſh* Manuſcripts on Parchment: But the Ignorance of their Criticks is ſuch, that tho' I conſulted the chiefeſt of them, as *O Flaherty* (Author of the *Ogygia*) and ſeveral others, they could ſcarce interpret one Page of all my Manuſcripts; and this is occaſioned by the want of a Dictionary, which it ſeems none of their Nation ever took the trouble to compoſe. I was informed (but how truly I know not) they have lately printed one at the *Iriſh* College in *Lovain*; which if I could procure, I ſhould not deſpair of being in a ſhort time able myſelf to underſtand theſe Manuſcripts; tho' many of them being but inſignificant Romances, it would ſcarce quit the Pains. What I moſt value amongſt them are their old Laws, which might give ſome Light to the Curious as to many of their National Cuſtoms; and ſome of their old Poems: But all are of uſe to any that would compoſe a Dictionary of their Language; which was anciently (conſidering the narrowneſs of their Knowledge as to Arts and Sciences) doubtleſs very copious.

I ſaw no Coins found there, but the *Roman* Gold Coin of *Valentinian jun.* formerly mentioned; ſeveral of our old *Engliſh* ſince the Conqueſt; and one caſt Braſs Piece inſcribed with *Runic* Letters, which I take to have been a *Daniſh* Amulet. Several of our old *Britiſh* Monuments, called *Kaer*, *Karn*, *Cromlech*, &c. we met with; and found that they diſtinguiſhed them by the ſame Names. What were peculiar to themſelves, were their high round Towers for Belfreys; their round Entrenchments, commonly called *Danes* Rathes; and the Elf-Arrow Heads of Flint.

About *Slego* and *Bali Shany* we had good Succeſs as to Figur'd Stones; where we met with Variety of *Aſtropodia* and *Aſtrorrhizæ*, or *Modioli*, not yet figured nor deſcribed, together with other Curioſities in that kind; all which (together with the Manuſcripts) I have long ſince ſent to *Oxford*.

In the ſame Neighbourhood, on the Mountains of *Ben Bulben* and *Ben Buiſhgen*, we met with a Number of the rare Mountain Plants of *England* and *Wales*, and three or four not yet diſcover'd in *Britain*. Mr. *Heaton's Chamædrys Alpina* is a common Plant on thoſe Hills, as alſo on divers other Mountains and Heathy Grounds in *Connacht* and *Munſter*. In the Iſle of *Aran* (near *Galloway*) we found great plenty of the *Adianthum verum*, and a ſort of matted Campion with a white Flower, which I bewail the Loſs of; for an imperfect Sprig of it was only brought me; and I waited afterwards in Rain almoſt a whole Week for fair Weather, to have gone in queſt of it. In moſt of the mountains of *Galloway* and *Mayo* grows an elegant ſort of Heath, bearing large Thyme-leaves, a Spike of fair purple Flowers like ſome *Campanula*, and viſcous Stalks. I know not whether it be any thing related to the *Ciſti Ladaniferæ*.

In the ſame Places *Pinguicula flore carneo minore* is a common Plant, and a ſort of *Ros Solis*, which I take to be undeſcribed. *Sedum ſerratum foliis pediculis oblongis inſidentibus* is exceeding common on all the Mountainous Tracts of *Mayo*, *Galloway*, and *Keri*. On the Mountains of *Keri*, *Sanicula guttata* grows in abundance; together with ſome other rare Plants, as the *Arbutus*. *Cotyledon hirſuta*. *Cirſium humile montanum Cynogloſſi folio polyanthemum R. Syn*. *Alchimilla Alpina pentaphyllos*. *Sanicula aizoides inter guttatam & Sedum ſerratum ambigens*. *Veronica procumbens maxima, an N. D? &c.* But the Tories fruſtrated our Curioſity here, tho' no where elſe in the Kingdom. *Pentaphylloides fruticoſa* we found plentifully amongſt the Lime-Stone Rocks on the Banks of *Loch Crib* in the County of *Galloway*; and Dr. *Merret*'s *Vaccinia rubra foliis Myrtinis criſpis* (a very beautiful Plant) we found to be no rarity in this Kingdom.

We met with ſome Marine Animals of the Exanguious kind, that were Strangers to us.

A Journey to the Pike of Teneriffe *by Mr.* Edens, *n.* 345. *p.* 317.

III. On *Tueſday Auguſt* the 13th *N. S.* at half an Hour paſt Ten in the Evening, I, in company of four more Engliſh and one Dutch-Man, with Horſes and Servants to carry our Proviſion, together with a Guide (which is the ſame that has conducted all thoſe that have been this Journey for many years) ſet forward from the Port of *Oratava*. The Night being ſomewhat cloudy, and the Moon in the full at 12 the Night following.

At half an Hour paſt Eleven we came to the Town of *Oratava*, which is about two Miles from the Port, where we ſtopt for about half an Hour, to get walking Staves to aſſiſt us in our aſcending the Steep of the Pike. At One a-Clock on *Wedneſday* Morning, we came to the Foot of a very ſteep Riſing, about a Mile and half above the Town of *Oratava*, where it began to clear up; and we ſaw the Pike with a white Cloud covering the Top of it like a Cap. At Two a-Clock we came to a plain place in the Road, which the Spaniards call *Dornajito en el Monte Verde* (the little Trough in the green Mountain) ſo call'd I ſuppoſe becauſe a little below this Plain, on the Right hand as we went, there is a deep Hollow; at the upper End of which Hollow, there is a Spout of Wood placed in a Rock, through which there runs very clear and cool Water, which comes from the Mountains; and at a Deſcent a little lower than the Spout there is a Trough into which the Water comes: At Three, after travelling a Road, which was ſometimes pretty ſmooth and at other times very rough, we came to a little wooden Croſs, by the Road ſide on the Left-hand, which the Spaniards call *la Cruz de la Solera* (The Croſs of the *Solera*) A *Solera* is a long Pole with a Hole at each end, which the Spaniards uſe to draw Wood with, by faſtning one end to the Wood and the other to the Oxen. This Croſs was made with a Piece of a *Solera*, and for that reaſon is ſo call'd, but why it was ſet up in this place I can't tell, unleſs it was becauſe ſomebody was kill'd thereabouts. At this place we alſo ſaw the Pike before us; and altho' we had come up hill quite from the Port, yet to our thoughts it ſeem'd almoſt as high here, as when we were there, the white Cloud ſtill hiding the greateſt part of the Sugar-loaf.

After riding about half a Mile further, we came to the ſide of a Hill which was very rough and ſteep, (the place call'd *Caravala*) where are a great many Pine Trees that grow on both ſides the Road for a great way, both on the Right-hand and the Left, one of which that was cloſe to the Road, on the Right-hand as we went, our Guide deſir'd us to obſerve; it having a great Branch growing out, which with the Boughs that were upon it look'd like the Forepart of a Ship. And from the likeneſs this Tree has to a Ship I ſuppoſe the Place took its Name, for *Caravela* ſignifies an old-faſhioned Veſſel formerly much uſed in *Spain*, ſharp before, ill ſhap'd every way, and all the Maſts ſtooping forwards; their Sails were all Mizen Sails, that is, Triangular; they all lie nearer the Wind than other Sails, but are not ſo commodious to handle. Amongſt theſe Trees, not a great height in the Air, we ſaw the Sulphur diſcharge its ſelf like a Squib or Serpent made of Gun-powder, the Fire running downwards in a Stream, and the Smoak aſcending upwards from the place where it firſt took Fire; and like this we ſaw another, whilſt we lay under the Rocks the next Night at *la Stancha*, part of the way up the Pike; But I could not obſerve whether either of them gave any Report as they diſcharg'd. At three quarters after Four we came to the Top of this high rough and ſteep Mountain, where grows a Tree which the Spaniards call *el Pino de la Merenda*, The Pine-Tree of the Afternoon's Meal. This is a large Tree, and is burnt at the Bottom, as having had Fires made againſt it; and in the burnt place there iſſues out Turpentine, a little of which I brought with me. At a few Yards diſtance from the Tree we had a Fire made, where we ſtay'd and baited our Horſes, and breakfaſted our ſelves. Theſe Hills are very ſandy, and there are a great many Rabbets which breed there; There is alſo much Sand found a great way up the Pike it ſelf, and not a great way below the Foot of the Sugar-loaf, ſome of which I brought down with me. At three quarters after Five we ſet forwards again, and at half an Hour paſt Six came to the *Portillo*, which in Spaniſh ſignifies a Breach or Gap. We ſaw the Pike about two Leagues and a half before us, cover'd ſtill with a Cloud at Top; and the Spaniards told us we were about two Leagues and a half from the Port.

At half an Hour paſt Seven we came to *las Faldas*, that is the Skirts of the Pike; from whence all the way to *la Stancha*, which is about a Quarter of a Mile up from the Foot of the Pike, we rode upon little light Stones, for the moſt part not much bigger than ones Fiſt; and a great many not much broader than a Shilling: and if we kept the beaten Track which was uſed before, it was not ſo deep, but if we turn'd out of it the Horſes went almoſt over their Feet. I lighted and made a Hole there, thinking to find how deep theſe little Stones lie, but could not find the Bottom; which makes me conclude they may cover the Ground for a great thickneſs. There are many great vaſt Rocks, ſome of them two Mile or thereabout from the Foot of the Pike, which the *Pike-man* told us was caſt out from the Top of the Pike at the time it was a *Vulcano*; many of them lie in Heaps of above threeſcore Yards long, and I obſerv'd that the further theſe Rocks lie from the Foot of the Pike, the more like they are to the Stone of other common Rocks: But the nearer we went to the Pike we found them more black and ſolid; and ſome of them, tho' not many, were gloſſy like Flint, and all extream heavy. Thoſe that ſhone ſo, I ſuppoſe, retain'd their natural Colour, but there are ſome that look like Droſs that comes out of a Smith's Forge, which without doubt was occaſioned by the extream Heat of the place they came from. Some of theſe great Rocks were thrown out of the *Caldera* or Kettle in the Top of the Pike; and others from a Cave or Ciſtern which is a pretty way up the ſide of the Pike, and has by ſome been thought to have no Bottom, more of which I ſhall ſay anon.

At Nine on *Wedneſday* Morning we arrived at *la Stancha*, about a quarter of a Mile above the Foot of the Pike on the Eaſt-ſide, where are three or four large hard and ſolid black Rocks lodg'd: under ſome of theſe we put our Horſes, and under others we lay down our ſelves to ſleep, after having refreſh'd our ſelves with a little Wine: and we had a Fire made in order to get our Dinner ready, where a Cook we took along with us both roaſted and boiled our Meat and Fowls very well. We ſlept here for about two Hours, then roſe again, and at about Two in the Afternoon went to dinner. There are ſeveral Mountains that lie Eaſtward from the Pike at four or five Miles Diſtance, call'd the *Malpeſes*, and one more lying a little more to the Southward call'd *la montana de rejada*; all which were formerly *Vulcano's*, tho' not ſo great as that of the Pike, as appears by the Rocks and ſmall burnt Stones that lie near them, juſt in the ſame manner as about the Pike. Still being at *la Stancha*, after we had dined we lay down again to take a Nap, under the Rocks as before Dinner, but not ſleeping very well we all got up again, the reſt of them ſpending the Afternoon at Cards, *&c.* But I made it my buſineſs to admire the ſtrangeneſs and vaſtneſs of that great Body, which indeed is very wonderful, inſomuch that its impoſſible to expreſs, to one that has never ſeen it, in what a manner that confuſed Heap of Rubbiſh lies; for it may very well be ſtiled one of the greateſt Wonders in the World. About Six at Night we ſaw *Grand Canaria* from *la Stancha* bearing from us *E.* by *N.*

At nine at Night, after having had our Suppers, we retired to our former Lodgings, where laying Stones for our Pillows and our Cloaks for Bed-cloaths, we endeavoured to get to ſleep, but all in vain for a great while. Some lying pretty nigh a Fire complain'd of being burnt on the one ſide and froze on the other (for the Air was very cutting and ſharp) others happening to lie in the place where there was a great many Fleas; tho' it be ſomething ſtrange that Fleas ſhould be found there, the place being ſo cold in the Night: perhaps the Goats ſometimes get under theſe Rocks and ſo leave them; and I am inclin'd to believe it, becauſe the Guide and I found a dead Goat in a Cave at the very top of the Pike. I ſuppoſe this Goat ſtraggling up here by chance was benighted, and ſo finding the Cold got into this place for heat, where meeting with too much of it, and a very ſtrong ſulphureous vapour, it overcame him; for he was almoſt dried to Powder. But to proceed, betwixt Eleven and Twelve we got to ſleep, and ſlept till One, when waking, our Guide told us 'twas time to prepare for our Journey. We immediately roſe, and by half an hour paſt One we were all upon the march, and leaving our Horſes and ſome of our Men behind, we went away faſting, excepting about two Mouthfulls of Wine apiece, which we took at our up-riſing. Betwixt *la Stancha* and the top of the Pike there are two very high Mountains and the Sugar-Loaf, each of which Mountains is almoſt half a Mile's walking: on the firſt of them the Rubbiſh is more ſmall, and we were apt to ſlip back as we ſtept upwards. But the uppermoſt is all compoſed of hard looſe rocky great Stones, caſt one among another in a very confuſed Order. After reſting ſeveral times we came to the top of the firſt Mountain, where we drank every one of us a little more Wine, and eat each of us a bit of Ginger-Bread we had amongſt us. Then being pretty well refreſh'd, we ſet forwards again to aſcend the ſecond Mountain, which is higher than the firſt, but is better to walk on becauſe of the firmneſs of the Rocks. After we had travell'd for about half an hour up the ſecond Mountain, we came within ſight of the Sugar-loaf, which before we could not ſee by reaſon of the Interpoſition of theſe great Hills. After we were arriv'd to the top of this ſecond Mountain we came to a way that was almoſt level, but bearing ſome ſmall matter up-hill; and about a Furlong farther is the Foot of the Sugar-loaf, which we ſoon after came to. Then looking upon our Watches found it to be juſt three a-Clock. The Night was clear where we were, and the Moon ſhone very bright, but below over the Sea we could ſee the Clouds, which look'd like a Valley at a prodigious Depth below us. We had a brisk Air, the Wind *S. E.* by *S.* as it was for the moſt part whilſt we were upon our Journey. Whilſt we ſat at the Foot of the Sugar-loaf, reſting and refreſhing our ſelves as before in other places, we ſaw the Smoak break out in ſeveral places, which at firſt look'd like little Clouds, but they ſoon vaniſh'd, others not long after coming in their room from the ſame or other places.

We ſet forwards to aſcend the laſt and ſteepeſt part of our Journey, *viz.* the Sugar-loaf, exactly at half an hour paſt Three, and after we had reſted twice or thrice, I left the Guide and the reſt of my Company, and ran forwards; and when I was got very nigh the top (which was at three quarters after Three) two more of the Company deſerted, and came up about five Minutes after me; the reſt of the Company and the Guide coming up to the top juſt at Four.

The Shape of the top of the Pike is partly oval, the longeſt Diameter lying *N. N. W.* and *S S E.* and is, as nigh as I could gueſs, about 140 Yards long; the Breadth the other way being about 110. Within the top of the Pike is a very deep Hole call'd the *Caldera* (or *Kettle*) the deepeſt part of which lies at the *South* end: It is I believe forty Yards deep, reckoning from the higheſt ſide of the Pike: but it is abundance ſhallower reckoning from the ſide oppoſite to *Garachica.* The ſides of this Kettle are very ſteep, in ſome places as ſteep as the Deſcent on the outſide of the Sugar-loaf. At the bottom of this Kettle we all were, where lie a great many very large Stones, ſome of them higher than our Heads. The Earth that is within ſide the Kettle, being roll'd up long and put to a Candle, will burn like Brimſtone. Several places within ſide the top of the Pike are burning, as on the Out-ſide; and in ſome places if you turn up the Stones you'll find very fine Brimſtone or Sulphur ſticking to them. At theſe Holes where the ſmoak comes out there alſo comes forth a great heat, ſo hot that one cannot endure one's Hand there long. At the *N.* by *E.* ſide within the top is the Cave where we found the dead Goat; in which Cave ſometimes the true Spirit of Sulphur diſtills, as they ſay, but it did not drop whilſt I was there. The Report is falſe about the Difficulty of breathing upon the top of this place; for we breath'd as well as if we had been below; we eat our Breakfaſt there, and I was up in all for about two hours and a quarter.

Without doubt the Quickſilver would have fell very much upon this high place, if I had had but the good Fortune to have got a couple of Barometers to try. But there is no ſuch thing in this Iſland, and I was fearful of not getting Company in the mind to go up with me another

Year (for to go up by ones ſelf is very chargeable) elſe I would have ſent to *England* to have been ſupply'd, tho' the Expence had come all out of my Pocket. Before the Sun roſe I think the Air was as cold as I have known it in *England*, in the ſharpeſt Froſt I was ever in; I could ſcarcely endure my Gloves off. There was a great Dew all the while we were there till Sun riſing, which we could find by the wetneſs of our Clothes; but the Sky look'd thereabouts as clear as poſſible. A little after Sun riſing we ſaw the Shadow of the Pike upon the Sea, reaching over the Iſland of *Gomera*; and the Shadow of the upper part, *viz.* of the *Sugar-loaf*, we ſaw imprinted like another Pike in the Sky it ſelf, which look'd very ſurprizing: but the Air being cloudy below us, we ſaw none of the other Iſlands but *Grand Canaria* and *Gomera*.

At ſix on *Thurſday* Morning we came from the top of the Sugar-loaf; at ſeven came to the Ciſtern of Water which is reported to be without bottom: this the Guide ſays is falſe; for about ſeven or eight Years ago, when there was a great *Vulcano* in this Country, the Cave was dry and he walk'd all about it, and ſaid that the deepeſt part of Water, when we were there, was not above two Fathoms.

The Dimenſions of this Cave I gueſs to be as follows.

Length about 35 Yards
Breadth ——— 12
Ordinary Depth 14 from Top to Bottom.

Upon the furthermoſt ſide grows white Stuff, which the *Pikeman* told us was Salt-Peter. There was both Ice and Snow in it when we were there; and the Ice was of a great Thickneſs covered with Water about Knee deep. We let down a Bottle at the end of a String for ſome of the Water, in which we put ſome Sugar and drank it, but it was the coldeſt I ever drank in my Life. The Ice was broken juſt under the Mouth of it, where we could ſee the Stones lie at the Bottom, for it was very clear. A little to the right hand within this Cave the Ice was riſen up in a high heap, in form of a Spire Steeple or like a Sugar-loaf; and in this place I believe the Water comes in. I ſhould have been glad to have come at it, to let down a Line to try whether there may not be ſome Hole that the Guide knows not of, that may be of great Depth. In our way home, we came by a Cave three or four Miles from the Pike, where are a great many Skeletons and Bones of Men; and ſome ſay there are the Bones of Giants in this Cave, but we know not how many Bodies are laid here, nor how far the Cave may go.

We came home to the Port at about ſix a-Clock this Evening, being *Thurſday*, *Auguſt* 15, 1715. *N. S.*

Obſervables in Flanders, *by* Mr. Ch. Ellis n. 285. p. 1416.

IV. At *Haerlem* I viſited *Van Dalen*, the Author *de Oraculis*; he is ſetting forth another piece *de Sacerdotio Veterum*, a moſt learned, laborious, and very inſtructive Work. He ſhewed me beſides his own, a Curioſity of a young Lady born Deaf and Dumb, yet taught by Dr. *Amman* to ſpeak very intelligibly, I heard her read *Dutch* and *Latin*; ſhe is about ſeventeen Years old, the only Child of a Wealthy Merchant.

Here I was deſirous to ſee the firſt Book printed by *Coſterus*, which *Van Dalen* himſelf had never ſeen, and with much trouble obtain'd to do it; I find it not to be *Donatus*, as the *Inſcriptiones Hollandicæ* ſay, nor *Virgil* or *Tully's Offices*, as others have acquainted the World; but a *Dutch* piece of *Theology*, printed on one ſide only of the Paper; and after this is a ſingle page of *Latin* entitul'd, *Liber Vitæ Alexandri Magni*, which made ſome believe it to be *Q. Curtius*, but it is a monkiſh *Latin* of that time. This and the *Theology* were printed in the Year 1430, whereas the *Inſcriptions* and ſome other Authors have told us from *Coſterus*'s Picture, that Printing was by him invented but *Anno* 1440. But a Picture of *Coſterus* before another *Dutch* piece (bound up in the ſame Volume and Printed 1432) bears the date of 1430, under which Picture is the *Inſcription* mention'd by Mr. *Ray*, (only the date ten Years ſooner) and the *Tetraſtic*, which is tranſcrib'd by the Author of the *Inſcriptions* from an *Effigies* of *Coſterus*, which was then extant in a Garden of this place, but is not now to be found.

I was ſurpriz'd at *Amſterdam* to ſee a moſt curious *Phyſick Garden*, admirably inſtructed, and in excellent order; which becauſe it has more ſpace and foreign Plants, far exceeds *Leyden*. Here are alſo *Series Lectionum*. Our Travellers have not made much mention, as I know of, of theſe things, nor any at all of *Boln*, where is a Chamber well furniſh'd with Rarities, conſidering there is no Univerſity, Schools nor Gardens, nor any Profeſſors. There are no Catalogues Printed in *French* or *Latin*, but when I have furniſht my Memory with the help of a little *Dutch*, if you have not receiv'd any Account, I ſhall tranſcribe them by themſelves, being too long for a Letter. Beſides theſe, there occurr'd here a Rarity not then publickly expos'd, two Female Children joyn'd together from the Neck to the Navel; their Picture was with Arms embracing, and Legs twiſted, all Parts and Joints entire to both, the *Viſcera* too all double and perfect, the Head only ſingle, but appertaining to both, and looking over the right Shoulder of one, and the left of the other. They had been open'd before I ſaw them; I could not learn by the Mother or Father, whether the *Aſpera Arteria* and *Gula* did not divide as they enter'd into the Stomach and Lungs, or whether they were continu'd ſeparate, nor any account of the Brain; they were born alive before ſeven Months: The Father, *John Ameſton*, a *French* Soldier, but deſerted to this place. He preſerves them with the Skin and Muſcles, by ſponging them with ſpirit of Wine. He asks 300 Guilders for 'em, too much for a Traveller to expend upon one thing.

At *Maeſtricht* I went into the Quarry, of which you have an Account in your * *Tranſactions*, but it is more wonderful than there deſcrib'd, and more large, being three Hours in length, and one in breadth, and capable to ſhelter 100000 Men. It coſt me a fit of an Ague, thro' its exceſſive

**n.67.p.2051. Abr.Vol.II.p.463.*

Chilneſs. The Stone dug from hence is much like our *Kettering*; The Jeſuits have here a very fine Chapel built of it.

Franciſcus Linus's Dyals at *Liege*, the Original of thoſe formerly in our *Privy Garden*, are ſhamefully gone to decay, none remaining of uſe, but that which diſtinguiſhes the Hours by feeling, and the Globe which ſhews it in all other parts of the World. Here is but one in the Society that underſtands any thing of this matter, and he is endeavouring to make a Weather Dyal, that ſhall have a Flux and Reflux like the Sea, but it is yet brought to no Perfection.

At *Namur* are no Curioſities, but Military, except only the *Cachot* cut in the Rock of the Caſtle, with Apartments for 600 Men, and all Rooms of uſe, as Kitchens, *&c.* this was done by the Order of Mareſchal *Boufflers* to defend the Garriſon from the Bombs, and was the labour of four Years. I forgot that at *Liege* is Sir *John Mandevil*'s Tomb, whoſe Epitaph is alſo at St. *Albans* with us, which may be hard to be reconcil'd.

Since my coming to *Bruxelles*, I have ſeen a young *Frieſland* Boy about five Years old, round the Pupil of whoſe Eye they pretend is naturally engraven *Deus Meus*, and the ſame in *Hebrew*. This is lookt upon as a prodigious Miracle in theſe Parts; but upon nice ſurveying it, I could perceive it was only the *Iris* of the Eye, not circularly joyn'd, but laſh'd out into *Fimbriæ*, which here and there might be thought to form ſome imaginary Letters; as beginning at the *Lacrymal* Corner of the left Eye, there is ſomething like D and I and V, but not a Footſtep for the ſtrongeſt Fancy to work out any more, nor any Letter of *Hebrew* in the right Eye, as they pretended. I don't doubt, but as the Boy grows up, the others may conjoyn again: But it was like to have been of danger to me to have diſcovered this Matter in theſe ſuperſtitious Countries; for acquainting a Gentleman in *Engliſh* of this Cheat, one of the Mob happen'd to underſtand it, and I was forc'd to make the beſt of my way.

In another Letter from the *Hague*, dated *June* 16, 1699. The ſame Perſon writes that at this Place there are very few natural Curioſities; but a piece of Art, that of its ſort I believe never was parallel'd, which is perform'd by one *Elizabeth Pyberg*, who cuts in Paper not only Towns, as *Loo* and *Hounſlerdyke*, but Faces to an extream Likeneſs; She has done King *William* and Queen *Mary* better than any Limner I ever ſaw, and refuſes 1000 Guilders for the Pieces; it is ſo curious that I could not believe the Queen's Drapery not to be Point, till I had moſt exquiſitely enquir'd into it.

Of the Sunk *Iſland in* Humber, *communicated by* John Chamberlayn, *Eſq; n.*361.*p.*1014.

V. It is call'd the *Sunk* Iſland, I ſuppoſe, from the ſinky marſhy Ground about it. One may make pretty ſure Gueſſes of its Original, becauſe 'tis yet within the Memory of Man, ſince it began to raiſe its Head above the Ocean, there being ſeveral old People here alive, who can remember when there appear'd nothing of it but a waſt and barren Sand; and that only at Low-Water too, when for the ſpace of a few Hours it ſhewed its Head, and then was buried again till the next Tide's Retreat: thus ſucceſſively it liv'd and died until the Year 1666, when it began to maintain its ground againſt the Inſults of the Waves; about which time it began to be reſcued wholly from future Danger, by the Care and Induſtry of Colonel *Gilby*, who having, as I am inform'd, a Leaſe or Gift of it from the Crown, did raiſe Banks about the riſing Grounds of it, and ſo defending it from the Encroachments of the Water, it became firm and ſolid; and in a ſhort time afforded good Paſturage for Sheep and other Cattel. The Expences at firſt to improve it to what it is, muſt needs have been very conſiderable; it being encompaſs'd with high Banks, and deep Canals for receiving and diſcharging the Liquid Element, which every now and then notwithſtanding threatens to re-poſſeſs it ſelf of its ancient Hereditament, but hitherto in vain; for I now acquaint you of its preſent Safety.

The Iſland is now about nine Miles in Circumference within the Banks, which ſeem to render it impregnable againſt all future Attacks of the Sea, and is of a very fat and fertile Soil, affords good Graſs, Corn and Hay, and is repleniſhed with numerous flocks of Sheep, which are of a larger Size and finer Wool than thoſe in *Holderneſs*, from which it is divided by about two Miles in Water; and from *Lincolnſhire* by about four. It is ſtor'd with vaſt Numbers of Rabits, that ſeem innumerable, they appearing through all Parts in prodigious Swarms; their Skins are counted the fineſt in *England*, of a dark Mouſe Colour, Shagg'd, and ſoft as Silk. There are alſo Cows and Horſes feeding conſtantly in the Place, with great plenty of Wild Fowl.

The Inhabitants are not ſo numerous, there being only three Families that live conſtantly upon the Place; however they are never too ſolitary, there being abundance of Workmen and Labourers that continually reſort thither; ſometimes I am told to the number of an Hundred and upwards, for the repairing of the Banks, *&c.* The yearly Income of the Proprietor Mr. *Gilby*, amounts to about 800*l.* and pays the King's Taxes to thoſe who Collect for the *Eaſt-Riding*, and is uſually up-lifted by thoſe of the Liberty and Townſhip of *Ottringham*, from the Marſhes of which there is a Paſſage over the Sands to the *Sunk* at Low-water. But this Cuſtom of paying the King's Ceſs to them, proceeds only from the Conveniency, not Neceſſity; for it never belong'd to that or any other Pariſh, ſo that I cannot reſolve you in what Dioceſe this Iſland lies, unleſs it had been united to ſome neigbouring Pariſh, or converted to one of it ſelf; which if effected, the Tythe of Lambs, Wool and Rabits, *&c.* would make up a handſome Benefice. It lies nearer indeed to the Dioceſe of *York*, by at leaſt two Miles, than to that of *Lincoln*, being two Miles South of *Holderneſs*, in the River *Humber*, and four Miles North of *Lincolnſhire*, *&c.*

Obſervables in Italy *by* Dr. Breynius, *n* 334 *p.* 447.

V. In Portu Liburno Octobris Calendis Anni 1703 appuli. Urbs in planitie ſita ad maris littora, montibus utrinque elatis, ut ut non admodum ampla, Emporium tamen elegans & probe munitum. Aer non admodum ſalubris, & Tertiana duplex, quæ hîc difficilioris curationis, frequens mihi narrabatur. Itaque quia Palladem hic Mercurio cedere intellexeram, poſt

octiduanam quietem, Piſam aliquot milliaribus Liburno diſtantem, cum quodam ex conterraneis meis Itineris Socio profectus ſum. Iter erat amœniſſimum, per planam fertilemque terram, interpoſitis ſæpius Nemoribus Quercu, Ilice, & Subere, ut & Myrto frequentibus.

Piſa quondam Reſp. & elegans Civitas, nunc M. Hetruriæ Duci ſubjecta ordine ſecundo, multum de priſtino ſplendore ac hominum copia, quod vulgo notum eſt, amiſit. Univerſitas fuit quondam hîc celebrior, quàm quidem hoc tempore. Quatuor habet Collegia Oxonienſibus nequaquam æquiparanda: quorum primum dicitur Collegium Sapientiæ; ſecundum eſt Collegium Ferdinandi, à Ferdinando I. M. H. D. Anno 1595. extructum in loco, ubi erant Ædes Bartholi famoſiſſimi J. C. ut docet Inſcriptio; tertium Puteanum, à Puteo Epiſcopo Nomen gerens, Anno 1605. erectum. Sed præſentibus feriis omnes Scholæ clauſæ erant, ipſis Novembris Calendis recludendæ. Hortus Botanicus Piſanus Rei Herbariæ Profeſſoribus ſatis notus à Coſmo I. M. Hetr. Duce Anno 1547. ſeptennio ſc. poſt Patavinum, qui primus fuit, inſtitutus eſt, eique præfectus Lucas Ghinus (teſte Caſtello in Opt. Med.) cui ſucceſſit Botanicorum ſui ævi Princeps Andreas Cæſalpinus. Citatus Lucas Ghinus, à Jo. Antonio Bumaldo (quo ficto Nomine Ovidius Montalbanus anagrammaticè latet) in ſua Bibliotheca Botanica primus Hortorum publicorum Academicorum Fundator dicitur. Ædes autem Horto adjacentes, in quibus plurima rariora Naturalia & Artificialia ſervantur, Ferdinandum I. Fundatorem agnoſcunt Anno 1595. ut Inſcriptio in portæ limine teſtatur. Antequam ad Hortum itur in atrio multa Balænæ oſſa repoſita videntur; in parte ſuperiore verò Gazophylacium rerum Naturalium & Artificialium bono ordine digeſtarum: Per aream ubi pergimus ad alteram Ædificii partem ad Horti Introitum ſitam accedimus, in cujus porticu variæ Effigies, ut Cæſalpini, Cluſii, Caſauboni, Matthioli, Ponæ, &c. in perpetuam Clariſſimorum Botanicorum Medicorumque memoriam ſuſpenſæ ex parietibus ſpectantur. In ſuperioribus conclavibus Antlia habetur pneumatica major, cum aliis quibuſdam Inſtrumentis Phyſicis, ut & Furni cum ſuis Chymicis Inſtrumentis. Hortus ipſe ſatis ſpatioſus eſt, non tamen exquiſitè cultus, quem Hortulanus ſenex 1500 Plantarum, ſed nullo fere ordine diſpoſitarum, ſpecies alere mihi affirmabat. Interim rariores quaſdam videbam alibi non obſervatas; imprimis oculum & animum meum delectabant,

Palma Dactylifera trium ferme virorum altitudine, fructibus onuſta, qui rarò hic plenam maturitatem aſſequuntur. Myrtus latifolia Bœtica ſecunda, vel foliis laurinis confertim naſcentibus, C. B. Pin. Arbor hæc in nullis aliis Hortis à me viſa, ſi arbor dicenda eſt, quæ multis ſtipitibus ex ſolo exſurgit ad duorum virorum altitudinem; Folia habet Aurantio Sinenſi, Ferrarii, ſimillima; Fructibus referta erat majoribus ex nigro cæſiis. Hortulanus Africanam eſſe aiebat. Styrax folio Mali Cotonei C. B. Pin. procera arbor fructibus maturis ornata. Ilex aculeata cocciglandifera, C. B. Pin. magnitudine ſpectabilis. Hujus Horti Catalogum quondam edidit Thomas Belluccius ejuſdem Horti Præfectus, & Botanices Prof. Ord. Impreſſus eſt Florentiæ 1662. in 12mo.

Aquæductus Piſanus, qui limpidiſſimam aquam per quinque Milliaria Italica ad urbem ducit, viſu dignus eſt, antiquus & temporis injurias ferens.

De famoſa illa Turri inclinata hic ſaltem monendum duxi, ejus fundamentum in illo latere in quo inclinatur, mox in vel poſt erectionem ſubſediſſe, hincque ſitum illum inclinatum, adeo decantatum, turrim, præter Architecti intentionem, acquiſiviſſe, quod facile examinanti patet.

Elapſis aliquot diebus relicta Piſa, Lucam iter aggreſſus, primò tranſivi planitiem ſatis fertilem, & ob agros Moro, Lauro, Populo, Ficu, &c. cum annexa Vite circumdatos viſu jucundam. Poſtea tranſcendendus erat Mons Sti. Juliani, ob Thymbram Montis Sti. Juliani dictam non ignotus, altus & petroſus, rarioribus nihilominus plantis ornatus; & in tranſitu præter dictam Thymbram varias obſervabam Ciſti tam Ledi, quàm Maris, & Myrti ſpecies, Lentiſcum nec non Ericæ & Sedi ſpecies aliquot. Ad montis pedem Lucenſium incipit Juriſdictio, in qua mox ſeſe Oculis noſtris offerebant Oleæ olivis, quæ inter optimas numerantur, Caſtaneæ etiam, Arbutus & Terebinthus fructibus onuſtæ maturis. Tandem nova & fertilis planities vineis abundans ad Lucam uſque Caput Reipubl. ſatis natæ. In hac parum quod Medicinam vel Hiſt. Nat. concernit vidi ſingulare. Hoc ſaltem obſervandum, me in hac Ditione, ut & in Hetruria, quamplurimos notaſſe agros Lupino vulgari ſemine albo, quo cocto homines veſcuntur, conſitos. Cæterùm ibidem & Ciceres, Milium, Sorgum, & Panicum in agris partim pro hominum, partim verò pro columbarum aliarumque avium uſu coluntur.

Hinc per Piſtoriam ad Hetruriæ Metropolin Florentiam iter meum direxi, ubi 17. Octobr. appuli. Innumera habet ampla hæc & elegans Civitas viſu digniſſima, ab *aliis recenſita, inter quæ Gazophylacium M. Ducis, quod *Galeria* appellatur, pretioſiſſimarum rerum arte factarum magno apparatu refertum, & ſplendidiſſimum Sti. Laurentii Sacellum M. Hetr. Ducum Sepulturæ dicatum, necdum perfectum, quibus cultiſſimos M. Ducis Hortos addas, facile primas tenent.

* *Riſtretto delle Coſe più notabili della Città di Fiorenze, & al.*

Maxima tunc temporis Florentiæ ornamenta erant Celeberrimi per totam Europam Viri Laurentius Bellini & Antonius Magliabechi. Ille M. Ducis Archiater, in Medicina, imprimis Theoretica ejus parte, quod variæ ejus teſtantur Lucubrationes editæ affatim, verſatiſſimus, & verè magnus Vir, in Praxi tamen (quod ſæpius etiam in aliis obſervatum eſt) non adeo felix. Vir eſt parvæ ſtaturæ, ſexagenarius, variis morbis fractus, ſiniſtri oculi à quinque jam annis Catarrhactâ laborans. Cum hoc de variis rebus Medicis mihi erat Sermo. Nihil ſtatuebat eſſe in Medicina, quod ingenio & ſtudio non poſſit expiſcari, cùm omnia ſecundùm leges Mechanicas fiant, præter minimarum particularum & Elementorum figuras, hancque eſſe rationem, cur Medicina nunquam ad perfectionis culmen perventura ſit. Aquæ Tetuzzianæ in Dyſenteriæ curatione adeo decantatæ ſcaturiginem prope Piſtoriam eſſe, me docebat, eamque continere Salem marinum ſive commune, & purgandi vi præditam eſſe; hinc pauperibus aliquando Salem marinum in Aqua fontana ſolutum propinari, ſimili, licèt non ſemper æquè felici cum ſucceſſu. Ab annis jam aliquot ſæpius vacavit Muſicæ & Poeſi, quas perditè ſe amare aiebat, continuis Meditationibus diſtractus.

Alter Antonius Magliabechi, M. Ducis ejuſque Fratris t. t. Cardinalis Bibliothecarius, in Librorum cujuſcunque generis cognitione ad ſtuporem verſatus, unde eum non immeritò Vivam à Sereniſſimo Duce Bibliothecam ſalutari tradunt. Vir hic erga exteros humaniſſimus eſt, quod ipſe ſatis ſuperque expertus ſum, cùm prima ſaltem vice ipſum in inſtructiſſima Bibliotheca Cardinalis, quæ in ſupremi Principis Palatio ſervatur, ſalutarem, ubi de variis libris me inſtruxit quàm lubentiſſimè. Inter Libros Medicos, ut & Hiſt. Nat. Scriptores, quorum magnus adeſt numerus, eminebat ſpiſſum Volumen in regali forma, vivas Plantarum Icones artificiosè ſuis coloribus expreſſas, additis Nominibus manuſcriptis, continens, cui Titulus: *Viridarium Botanicum, in quo Arborum, Fruticum, Suffruticum, Stirpium, & plurimarum Plantarum tam indigenarum, quàm exoticarum Species lætè virentes perennantur; quas è diverſis locis collegit & delineavit, coloribus naturam imitantibus pinxit, & celebrium Botanicorum Nominibus diſtinxit Joſephus Baldius, Medicus, Phyſicus, Civis Florentinus, Academicus Apatiſta* 1650. Poſtmodum toties miratus ſum, quoties vidi Celeberrimum Virum, præſertim in ædibus propriis, in quibus vix locum invenies, qui Libris repletus non ſit; adeo, ut, qui Libros ejus Elementum vocat, in quo degit, non à vero aberret.

Inter Bibliothecas, quæ pulcherrimam hanc urbem etiam Doctis commendant, non ultima eſt quæ Sti. Laurentii dicitur à Templo adjacente homonymo. Hæc non minus ob elegantem Architecturam, quam famoſiſſimo Michaeli Angelo Bonarotio debet, quàm imprimis ob inſignia in omni Facultate MSS. ex quibus tota ferme conſtat, ferreis catenis uti in Bodleana Oxonienſium alligata, commendabilis. Inter Medica mihi maximè notabile videbatur vetus aliquot MSS. in Folio in membrana exaratum, cum figuris vivis coloribus expreſſis ad luxationes præſertim pertinentibus, ſequenti titulo: *Chirurgia Hippocratis, Galeni, Oribaſii, Heliodori, Aſclepiadis Bithynii, Archigenis, Dioclis, Amyntæ, Apollonii Ther. Nymphodori, Ruffi Epheſii, Apollonii Citienſis, Sorani, Pauli Æginetæ, Palladii.* Hoc MSS. ut me D. Magliabechi certiorem fecit, tranſcripſit Jacobus Tollius, poſt cujus mortem eo jam potitur Hainius Profeſſor Dusburgenſis illud propediem publicaturus. Hic & Dioſcoridis codex MSS. aſſervatur, in charta ſcriptus, qui tamen non admodum antiquus videtur.

Imprimis grata mihi hic fuit converſatio cum admodum Rev. Patre Brunone Tozzi, Monacho Valombroſano, cujus ſanè humanitatem & in Botanicis peritiam ſatis deprædicare nequeo. Incredibilis eſt ejus in inquirendis Plantis diligentia, quam ob rem ſingulis annis Hetruſcas Alpes perreptat, Plantaſque collectas propria manu vivis coloribus quàm accuratè depingit. Promiſit Catalogum Plantarum in Hetruria naſcentium, cum non deſcriptarum Iconibus, quarum nonnullæ jam erant ſculptæ. Ducebat me ad Noſocomium Stæ. Mariæ, quod Italiæ, ſi non totius Europæ, pæ, ampliſſimum dicitur, in quo ingens Ægrotantium numerus egregiè curatur. Vidi cum eodem etiam Laboratorium Chymicum M. Ducis, quod *Fonderia del Grand Duca* appellatur Italis, in quo quamplurima Præparata Chymica cum Furnis & Inſtrumentis ſervantur. Hic obſervabam modum conficiendi varias Eſſentias odoriferas per integram Europam ferè decantatas, quæ Eſſentia de Bergamotte, Cedro, &c. vulgo nominantur. Præparantur ſcilicet per diſtillationem (ſecus ac Romanæ Eſſentiæ, quæ per expreſſionem ſaltem fiunt) ex corticibus per Veſicam & Serpentinam, ſola addita aqua communi, à qua poſt diſtillationem Oleum ſupernatans Eſſentia dictum ſeparatur. Aquæ autem odoriferæ ex Floribus, hic abſq; ullius aquæ additione diſtillari ſolent, & ſunt excellentiſſimæ. Præter hoc Laboratorium Florentiæ quoque habetur M. Ducis Pharmacopœia, in qua inter rariora Monſtroſi aliquot fœtus in Sp. Vini ſervati, ut Lepus octipes, Caniculus biceps, Caniculus monophthalmos in fronte, & alii mihi demonſtrabantur. Idem D. Tozzi mihi viam aperuit ad ſumme Rev. Abbatem Monaſterii Ripolitani Valombroſæ Virgilium Faluſium, multa ætate provectum, ſed humanitate, & in Botanicum Studium amore, quod ejus Proſopopœia Botanica teſtatur, nemini ſecundum. Botanicis Hetruſcis quoque annumerandus eſt D. Petrus Antonius Michaeli junior Bibliopola, ſupra nominati D. Tozzi amicus. Hic Rei Herbariæ ſtudioſiſſimus, imprimis Methodi Tournefortianæ gnarus, qua adeo & non abſque ratione delectatur, ut integras Tournefortii Inſtitutiones Botanicas ipſe ad ſeptem circiter plagas in forma duodecima contraxerit, quibus tamen omnes figuras Tournefortianas genericas cum Nominibus & claſſium Inſcriptionibus complectitur.

Antequam Florentiam relinquam, non poſſum planè ſilentio præterire elegantiſſimæ hujus Urbis dedecus, feneſtras videlicet chartaceas plurimarum ædium, ut & Palatiorum nonnullorum, quas frequentiores adhuc Piſæ & Lucæ annotaveram. Miror ſanè incolas aliàs in Ædificiis ſatis ſplendidos hac in re adeo eſſe negligentes; cùm tamen Vitra ibidem non majoribus, quàm alibi ſumptibus parari poſſe perſuaſus ſum.

D. 30. Octobris me Romam contuli; tranſibam Senam linguæ Toſcanæ puritate celebrem, poſtea & Montem Radicofani præaltum, ad cujus radices deſcendendo incipit Juriſdictio Papæ. Bolſena Oppidum eſt ad lacum ejuſdem Nominis ſitum, ad cujus ſiniſtrum latus via regia eſt Sylvæ quernæ adſita. Quercus hic ſolent eſſe humiliores, gallis majoribus refertæ, ut & excrementis illis, quæ Pilulæ capillatæ, C. B. Pin. Lobelio verò rectiùs Bedeguaris effigie excrementum ſpongioſum & muſcoſum. Frequens quoque Quercus calyce echinato, glande majore, C. B. Pin. à me obſervabatur. Montes erant ſaxei, multis in locis ex Baſalte compoſiti, multis cavernis & ſpecubus olim arte ut ſuſpicor excavati. Monte-Viaſconi dictum Oppidulum à Vino muſcato optimæ notæ *Eſt*, *Eſt*, *Eſt*, adeo notum.

D. * Miſſon inſcriptionem Sepulchri non rectè notavit quam ſequentem deprehendi:

* Voyage d' Italie.

EST. EST. EST. PPR. NIUM
EST. HIC. IO. DEUC. D.
MEVS. MORTUS. EST.

Viterbium Civitas eſt poſt Senam in hoc Itinere maximè notabilis & ſatis ampla Pontifici ſubjecta; ad cujus dextrum latus, cùm Thermas reperiri Naturales, *Bulicanti*, i. e. bullientium nomine ibidem cognitas, unum milliare Italicum diſtantes audiviſſem, eo mox me mea duxit curioſitas. Inveni autem eas decliviori loco, in ſolo albicante arido & quaſi calcario, odore ſulphureo & fumo mox adeuntibus ſeſe prodentes. Sapor quoque ad ſulphureum admixta aliquali ſalſedine accedebat. Primariæ in loco aliquantulum elatiori ſitæ, multis ſcaturiginibus ex terra propullulantibus compoſitæ, muro lapideo humili heptagonæ figuræ cingebantur, Balneum Regis Bathonienſe magnitudine ferme adæquantes. In uno muri latere ſequens ſaxo inſculpta legitur inſcriptio:

D. O. M.
Ars Ortulanorum
feci A. D. MDC.

Aqua eſt calidiſſima, ita ut manum, ſi paulo diutius in ea detineatur, comburat, & Ova brevi induret. Ex his 4 rivuli veloci curſu prodeuntes adjacentibus Thermis ſecundariis aquam largiuntur, ſed caloris longè remiſſioris. Rivulorum fundus ſaxeus eſt, albus ex ſedimento, aquæ calcario ortus, quo refertam eſſe ſtipites quoque Cannabini ſimili cruſta lapidea & calcaria undiquaq; obducti, quos ibidem colligebam, teſtantur. Multis in locis concretum hoc ſedimentum coloris eſt virideſcentis, quod aquæ quoque dictum colorem conciliat. Fere neglectæ mihi hæ Thermæ videbantur, quod tamen ſummopere mirabar, etiamſi internum earundem uſum ob copioſè admixtas particulas calcarias nemini ſuaderem. Cæterùm in Thermis hiſce ſecundariis Cannabim macerare ſolent accolæ.

Remarks by Dr. Tancred Robinſon *in his Travels, in* 1683 *and* 1684. *n.* 349. *p.* 473.

VII. In my Journey from *Rome* to *Naples* I obſerv'd on the Rubbiſh of the *Tre Taberne* an unuſual Vegetable for that place, remote from Town or Houſe, which was the *Ficus Indica Spinoſa* commonly call'd the *Opuntia* or *Tuna*, and by our Writers of *America* the *Prickly-Pear*, whoſe Juice gives the Urine a red Colour; when I came to *Naples*, I found it there near the Rocks, and in ſome wild ſolitary Places like a Native. If the *Spaniards* planted it, they choſe deſert Situations. On this Plant the *Cochineel Vermiculus* is ſaid to feed in great Numbers, before it changes into the *Chryſalis* or *Aurelia* of a *Lady-Cow*: but the Colour lies in the *Nymph Worm* before it turns a *Beetle*. This gives me occaſion to reflect upon the many Species of our *European Vermiculi*, ſome of which might be found to yield rich Colours (if try'd): We are certain

the Maggot of our *Ilex* gives the *Kermes*, and a noble Scarlet Die before it turns into a Fly. Many Shell-Fiſh (which are a ſort of Inſect) contain Purple Juices. This brings on another Remark I made in paſſing the *Apennines* and *Alps*, where I noted in ſome Beds or *Strata*, and even in the midſt of the hardeſt Rocks, great varieties of perfect Shells, that never occur'd to me on the *Italian* Shores, nor in any of the numerous *Muſeums* of that Country: ſo I gueſs they might be *Exotick*.

Going further on the *Via Appia*, I obſerv'd abundance of the *Siliqua Arbor* or *Carob Tree*, commonly call'd *Panis S. Joannis Baptiſtæ*; on the Pulp whereof many poor People were feeding. The Husks taſted like *Manna* to me. Near them grew plenty of the *Arbor Judæ*. The *Arbutus*, or *Strawberry Tree*, was common in the woody places; if this grows wild in the South Weſt Parts of *Ireland*, as ſome affirm, I ſhall think them much warmer than any Counties of *England*.

Before I enter'd the beautiful *Campania* of *Naples* large Woods of *Cork Trees* grew on each ſide the Road, where the Inhabitants were decorticating them. I ask'd if the Trees did not periſh: they anſwer'd, ſome did, but the Acorns return'd annual Supplies. The Women and Children wore Shoes made of the Bark.

Coming near *Capua* I obſerv'd a Species of Aſh, or *Ornus*, on the Trunk whereof many Saccharin Concretions were viſible. This prov'd the true *Manna*, that iſſues out thro' the Inciſions made in this Tree by the Inhabitants of *Calabria*. Swarms of *Cicada*'s were ſucking the Body and Boughs, and perhaps by wounding them made way for freſh *Manna*. Here I may note, that many Inſects have not only a *Proboſcis* to bore and draw out the Juices of Plants for Aliment, but other proper Inſtruments to convey their Eggs into Vegetables and Animals, where they may find Covert and Food when they come to hatch, in the Gall-Tumours, and other Excreſcences occaſion'd by the Wounds of the Parent Inſects, that make ſuch variety of *Cuniculi* in all parts of Plants, and even in the cutaneous parts of living Creatures and in dead Fleſh. This confirms me, that many Gums and Exudations find their way out of Vegetables thro' the Wounds of Inſects and other Apertures. Moſt *Voyagers* thro' the *Eaſt Indies* affirm, that *Gum Lack* is work'd and made by large *Ants* that cover the Trees. I rather think the Inſects ſuck and terebrate the Tree, and ſo give vent to that peculiar Sap that hardens in the Sun. This may extend to moſt Balſamiferous, Gummiferous, and Saccharine Plants, eſpecially in hot Climates where Inſects abound, and are more active. In cold Climates the Saps of many Vegetables will boil into Sugars, as that of Maple, Birch, Reeds, *&c.* Not but that the Fluids of Plants (like thoſe of Animals) will ſpontaneouſly break thro' their Veſſels in a Plethory, and make on the ſuperficial Parts various Eruptions and Congeſtions. I may here take notice there are many adulterations of *Manna*: all paſſes for the *Calabrian*, whereas that of *Brianſon* is from the *Larix*, that of *Perſia* from the *Myrica*, and theſe frequently mixt with the Juices of Spurges, and other Purgative Ingredients. I muſt not here deny that Dew will ſometimes in cool Mornings ſhoot, and congeal into a ſolid, ſweet, white Subſtance, which I once obſerv'd in very hot Weather before Sun-riſe.

Upon viewing the *Vulcano's* about *Naples*, *Veſuvius* on the Eaſt ſide, the *Solfatara* and *Monte di Cinere* on the Weſt near the *Puzzuolo* and *Bajæ*; I obſerv'd the ſame face of Nature, which I believe runs thro' all the other *Vulcano's* of our Globe, *viz.* heaps of Pumice Stones and Cinders of *Marchaſites* on the ſides, with Beds of Flower of Brimſtone on the tops. The Holes and Cavities in thoſe calcin'd Minerals ſeem to be the *Nidus* of the *Sulphur*, which hath been ſublim'd by the Heat and Fire of that vaſt Maſs of *Pyrites*, that compoſe the Bowels of thoſe *Vulcano's*, and lie ſcatter'd thro many parts of the Earth, even under the Sea, where they ſometimes germinate, ferment, and take Fire, throwing up little *Iſlands*. Earthquakes and other *Choc's* of the Globe may ſpring from the Mines of theſe combuſtible and exploſive Minerals, loaden with Brimſtone and elaſtic Salts. Hence ſome account may be given of *Thermæ* or hot Baths, whoſe Waters gliding thro' theſe hot Beds take their *Gas*. Of ſuch Medicinal boiling Waters and Stoves, there are more about *Naples* than in any place I ever ſaw or heard of, the whole Country being continually pervaded by hot Steams.

Walking round this City I found *Palm Trees*, ſome with unripe *Dates* hanging down, others without any Fruit; and there was another Species of *Palm* that ſweats out the *Gum Dragon:* I ſuppoſe the Monks had tranſplanted them out of *Africa*. I ſaw growing here many *Sugar-Canes*, *Rice*, *Maiz*, abundance of the purging *Senna* and *Cummin* Seed. Thro' the whole *Campania* of *Naples* I obſerv'd the ſame Vegetables to be larger and more proud than in other parts of *Italy*, as the *Platanus*, the *Lentiſcus*, the *Terebinthus*, the *Piſtaches*, the *Oleanders*, *Agnus Caſtus*, *Barba Jovis*, the *Tragacanth*, the *Styrax*, the *Capers*, *&c.* The *Melons*, *Jujubes*, the *Azaroles*, and other Fruits were of a better Taſte. The *Goſſypium*, with the Cotton breaking out of the husks, adorn'd ſome of the Fields; the Hedges full of *Pomegranates*, *Almonds*, *Tamariſk*, *Sumach*, *Cedrus Lycia* (a ſort of Juniper or Savin) abundance of *Phillyrea*, *Alaternus*, *Ciſti*, *Cytiſi*, *Myrtles*, *Spaniſh Broom*, *Bays*, *Lauruſtines*, *&c.* all wild, indigenous of that warm Soil and kind Climate. The Water-Melons, the Olives, the Oranges, Lemons and Citrons were better than about *Genoa* or in *Provence*. The *Lotus Arbor* or *Nettle Tree*, the *Paliurus* or *Chriſt Thorn*, the *Ricinus* or *Palma Chriſti*, common in the Hedges, with ſeveral *Thymelæa's*.

I ſaw them fiſhing for *Coral*, and *Hippocampi:* the firſt did not come ſoft out of the Sea; the hard Incruſtation covers the vegetable part that bears Seed, as the *Alga's* and *Fuci* do. They take the *Sword-Fiſh* by darting a Spear into him, as they do the *Whales* in the *Greenland* Fiſhery.

When dark Night came on, I could ſee multitudes of Luminous Flies thro' the *Campania* of *Naples:* perhaps our Male-*Gloworm*, or flying *Cicindela*, may abound there; not but that many other Inſects may carry ſuch Lanthorns about them. The *Scorpions* creep out about that time; and I have found them often in Bed, with the *Punaiſes*. The Hedges are full of *Lizards* of various Colours; and the *Cicada*'s chirp and ſing towards Evening. I obſerv'd ſeveral Species of ſtinging Spiders in the Corn-Fields, ſome of which, in hot Harveſts, may prove *Tarantula*'s; the Poyſons of Animals and Plants increaſing with the approach of the Sun, and the Heats of Climates. Abundance of Silk-Worms were ſpinning on the Trees and Shrubs; the Birds prey'd upon them, before they could change into *Papilio's*, as they do upon Swarms of *Locuſts*.

I eat often their young Frogs, Tortoiſes and Snails, ſerved up with Oyl and Pepper, which agreed well with me: ſo did their *Sea Urchins*, and the *Urtica Marina*, (called *Sea Jelley* or *Blubber*, though it be an Animal having a true Heart, and Veſſels for the Circulation of Fluids.) Some of their Thiſtles are no ungrateful Sallet. I ſaw ſome Vitriol Works about *Siena*, *Rome* and *Puzzuolo*; thoſe of *Alum* only about *Civita Vecchia*. Amongſt the Sands of the *Adriatic* Sea I obſerv'd many white, clear, ſhining Flints; which they told me were carried to *Venice*, to make fine Cryſtal Glaſs at *Muran*.

The Magnificent *Septizonium* figur'd by * Dr. *Muſgrave* ſtood near the Foot of the *Palatine* Hill, on the *E. S. E.* ſide, overlooking the *Via Appia* and the *Circus Maximus*, the *Amphitheatre* of *Titus* being near on the other Side. By the number of *Portico's* (which were Seven) it might contain Multitudes of People, as Spectators of the Triumphal Entries and the publick Games. But I would not be thought to differ from our *Learned Countryman*, who with good Authority, thinks it the *Sepulchretum* of that Imperial Family; tho' moſt of the Ancient *Mauſoleum*'s, (at leaſt thoſe I ſaw) were *Rotonda*'s, or *Columbaria*'s, for the more convenient placing the *Urns* of the Kindred; as that of *Auguſtus* near the *Campus Martius*; that of *Adrian* on the other Bank of the *Tyber*; thoſe ſaid to be of *Scipio*, of *Cicero*, and *Munatius Plancus*, near *Gaieta* and the *Via Appia*; that of *Virgil* on the ſide of mount *Pauſilippus*; that of *C. Metella* and ſome others on the *Via Flaminia*. Some were Pyramidal, as that of *Ceſtius* in the Wall of *Rome*, and a few others on the publick Roads. This *Septizonium Severi* ſeems to differ from the reſt of thoſe Ancient *Sepulchretum's*, which might be varied according to the Fancy and Humour of great Families. This Urn Burial was only in Faſhion amongſt the *Gentes Majores:* as for the dead Bodies of the *Plebeians* and Slaves, they were generally laid in places where they had dug Stone; and thoſe Quarries became *Catacombes*. The Laws prohibited them to bury within a City, unleſs the Bodies were firſt reduc'd to Aſhes.

* Geta Britannicus.

I obſerv'd in many of the Ruins about *Rome* and *Naples*, great Stones laid cloſe, and wedged very faſt with little or no Cement; the Bricks, towards

wards the middle of a Building, were generally of a *Rhomboidal* Figure very Smooth, Shining and Hard, laid in Plaiſter as firm as Marble. Their Mortar was much more durable than ours, as appears at this Day by their *Aquæducts* and *Piſcina's*, the *Cento Camare*, and *Caligula's* Bridge under Water at *Bajæ*. *Pliny* ſays, they made uſe of the *Terra Puteolana*, but the preſent Inhabitants have loſt the way of tempering it.

During my abode at *Genoa*, *Leghorn*, *Oſtia* and *Civita Vecchia*, I obſerv'd many *Torpedo's* or *Cramp-Fiſhes*, moſt accurately Anatomized by S. *Lorenzini*; plenty of *Sphyræna's*, (a Species of a Sea-Pike, a-kin to the Needle-Fiſhes.) The *Uranoſcopus*, call'd *Bocca in Capo* and *Prete*. The *Mola* or Sun-Fiſh. The *Dentex* or *Pentalis*, *Altavela's* a ſort of *Paſtinaca*. The *Peſce Baleſtra* or *Capriſcus*. The *Peſce Pettine* or *Novacula*. The *Zygæna* or Ballance Fiſh, as large as the Saw-Fiſh or moſt Sharks. The *Scolopax* or *Trombetta*, call'd by our Seamen the Bellows or Trumpet-Fiſh. The *Draco Marinus*. The Tunny-Fiſh. The *Centrina* or *Peſce Porco*. The *Aquila*. The *Scorpius Major*, with Varieties of *Turdi* in the Markets. But what pleas'd me moſt, were ſome odd Sea Animals, as the *Lepus Marinus*, (a Species of naked Snail) the *Hyſtrix Marinus*, or *Eruca*, call'd by the Seamen *Pincio*, with a Bruſh hanging out of the Tail, like the *Byſſus* or Silk of the *Pinna*. Many *Tamburo's* or Drum-Fiſhes; Plenty of *Muræna's*. I obſerv'd a ſtrange Sea-Animal, call'd the *Microcoſmo marino*, with many Shells, *Tubuli* and Vegetables growing or ſticking to the Back of it; this appear'd to me a-kin to the *Echini Marini*, or rather the *Stellæ Marinæ*, being Triangular, and ſometimes *Pentadactylous*.

I embark'd once with the Fiſhermen, who ſhew'd me ſeveral *Loligo's*, *Polypi*, and *Sepia's*, or Cuttle-Fiſhes, (all *Cruſtaceous*) ſome of them were caſting out their Ink in the Water: I ſuppoſed ſome Sharks, Dog-Fiſhes, or other Enemies, were near them; this black Liquor may be in the Gall of thoſe Animals. In the Nets, I often found Sea-Inſects, and Vegetables; and indeed a new World, undeſcrib'd by natural Writers, at leaſt unknown to me: but for want of the Art of Deſigning or Drawing, abundance of things eſcap'd me, and were utterly loſt; therefore I would adviſe all Travellers to be converſant in that moſt uſeful Science.

I obſerv'd the *Italians* near the *Alps* and *Apennines*, call'd ſeveral Birds *Francolino's*, as our Red, Grey and Black Game; and even their red and white Partridges; the different Colours of the Hens from the Cocks, the many Variegations in Feathers, the different Ages and Places, have all given occaſion to multiply Names and Species; the ſame may happen in Fiſhes, Quadrupeds, Inſects, and all the Diviſions of *Zoology*; and even in *Botany* and *Mineralogy*. The *Italians* call many of their little fat Birds *Beccafigo's*, that feed upon Figs, Grapes, and other ſweet Fruits. So the *French* multiply their *Ortulans*, taken in the Vineyards and Gardens. Some of the Ancient Writers take notice that the *Romans* uſed to feed their Geeſe and other Birds with Figs, when they intended to ſwell their

Livers to a monſtrous Bigneſs. The *Merops* or *Apiaſter* is common on their Brooks; it flies like our Kings-Fiſher, and preys not only upon Inſects but Fiſh. There is a very beautiful Bird in *Italy*, that ſuſpends its Neſt down from the Boughs of Trees. When I ſaw it fly by me, I took it for an *Indian*, from the Brightneſs of its Colours; it is as large as our Miſſel-Bird and Thruſh, *an Icterus Plinii?* The great *Cock of the Wood* (ſaid to be found in *Ireland)* is common on the ſides of the *Italian* Hills, and brought frequently to the Markets. I ſaw twice or thrice the *Himantopus*, and the *Phœnicopterus* or *Flamingo*, (whoſe Tongue was a Dainty amongſt the *Romans*, when they grew Luxurious.) I obſerv'd ſome *Spoonbills:* theſe three laſt Birds were wading in the Rivers and Marſhes, near the Sea. Once I ſpy'd ſome *Pelicans* on the *Adriatick*, near the mouth of the *Po*. The *Avis Diomedæa* was hung up dry'd in one of the *Muſeums* at *Florence*, but they told me it had been taken on ſome of the Iſles of the *Archipelago*. On the *Laguna* of *Venice*, I ſaw ſeveral Species of *Mergi*, *Lari*, *Colymbi*, and other Water Fowls, moſt of which Div'd. I was ſurpriz'd with the Variety of them, having not ſeen ſo many on other Coaſts: perhaps the hard Winter had forc'd ſome unuſual Birds thither. The Monks and Fryars told me, they eat ſome of thoſe Sea-Birds in *Lent* and on Faſt-Days, becauſe they liv'd upon Fiſh, and had a piſcoſe Taſte, as the *French* pretend their * *Macreuſe* to have, which is a ſort of Sea-Duck, common on the coaſt of *Normandy*, and brought to the Markets, even at *Paris* on *Maigre*-Days.

Buffalo's are common in the Kingdom of *Naples*, and in ſome parts of *Lombardy*, where they plough and draw with them. A peculiar Cheeſe is made of their Milk (call'd *Caſio di Cavallo)* rowl'd up like ſtiff pieces of Ribbon. Out of their black ſhining Horns they make Snuff-boxes and Combs. The Creature is unruly, and therefore they lead them with Iron or Braſs Rings drawn thro' their Noſes. They make a Buff-Leather of their Skins. I once ſaw ſome hairy Sheep feeding on a Common; perhaps they had been brought from *Africa*. In paſſing the high *Alps*, I had a View of the *Ibex* or *Steinbock*, whoſe large Horns are recurvated almoſt as far back as the Tail; they are very ponderous for the Bulk of the Animal, having many knotty Rings, that may help them in climbing. They are rarely taken. The *Rupicapra* or *Chamois*, is very common on the ſides of the Cliffs, whoſe Skins afford the ſoft Leather. The *Mus Alpinus*, or *Marmota*, is as large as a Rabbet, will ſoon grow tame in Houſes, tho' brought down from the Summits of the higheſt Mountains, where it will grow fat.

I have ſeen in ſeveral Town of *Italy* freſh ſtrong *Porcupines*, which the Inhabitants told me were taken in the Hedges and Ditches thereabouts, tho' much more rare than our Land-*Urchins*. In the *Griſons* Country, and in ſome Cantons of *Switzerland*, I have often obſerv'd the *Ranunculus Viridis* or ſmall Tree-Frog, perching on the Boughs and Leaves. In the Northern Parts of *Germany* I ſaw ſeveral *Elk*-Skins, and thoſe of the

Rhin-

* Phil. Tranſ. *n.*172.*p.*1036. Abr. Vol. II. *p.* 850.

Rhin-Deer ſtuffed, and ſet up in *Muſeum*'s, but never alive: tho' the Animals are ſaid to be common in *Muſcovy* and *Lapland*, and ſometimes ſeen in the Foreſts of *Pruſſia*. The Skins of *Hippopotami* (ſaid to be the *Behemoth*) are in ſome Collections of Curioſities in *Italy* and *Holland*: ſo are thoſe of the *Musk-Deer*, one of which is in the *Muſeum* of our *Royal Society.*

Remarks in a Journey into Denmark *and* Holland *by Dr.* Oliver, *n.*285.*p.*1400.

VIII. The Colleges and Schools in *Copenhagen*, both as to their Structure and Foundations, are very ordinary: The beſt I ſaw there was the Gift of the Learned *Borichius*, and conſiſts of twelve Apartments for as many Students, which are conveniently provided with Stoves for their manner of living in that cold Country. There is in it a ſmall School for publick Exerciſes, and a little Library belonging to their College; the reſt of the Students, except one hundred maintained by the King in ſmall Colleges, live at Lodgings in the City, as at *Leyden*, and other Univerſities abroad, who, when the *Swedes* threaten'd them with a Bombardment in the Year 1700, formed themſelves into a Batallion, and did Duty there, all the while the Enemy was on the Iſland of *Zealand*. There are in this Univerſity, erected about two hundred Years ago, about a thouſand Students, and ſometimes they have had near fifteen hundred. The Univerſity Library, over one of their Churches, in one large Room, conſiſts of ſeveral Libraries, the Gift of particular Men which are kept apart, with the Benefactors Names over them in Capital Letters. The Royal Library, belonging to the King, conſiſts of a great Variety of Books, well condition'd and well choſen, of all Languages; the Books of each Country being placed by themſelves: The Room is large and well built, and has a large Gallery ſupported by Pillars on each ſide. If *Gudius*'s Library at *Gluckſtadt* be added to this, as I was told it wou'd, this Library may be reckon'd of the firſt Rank of the *Europæan* Libraries.

The Kings Chambers of Rarities are in all eight, large and well built over the Royal Library: They are furniſhed with great Variety of Natural and Artificial Curioſities. The firſt contains Coins and Medals, Gold and Silver; Modern and Antique; *Grecian*, *Roman*, *Daniſh* and *Oldenburgh*; beſides other *Europæan* Nations, diſtinctly kept by themſelves, which make altogether a very valuable Collection. Amongſt the Natural Curioſities which are in the other Chambers, the moſt remarkable are;

1. The Petrified Child: This is the ſame Child that * *Bartholine* makes mention of. This happen'd at *Sens* in *Champaign*, *anno* 1582, when it was Cut out of its Mothers Belly, where it was ſuppoſed to have lain about eight and twenty Years. That it's an Humane *Fœtus*, and not Artificial is viſible to our Eye. The upper part of it is of a Gypſeous Nature, not ſo hard as the lower, the Thighs and Buttocks being hard and perfect Stone as can be, of a Red Colour, and of a Grain and Superficies exactly like thoſe I have ſeen taken out of the Bladder. I had the Curioſity to have it near me; and touch'd and felt it all over. This was convey'd

* Hiſt. Anat. Paræus, Licetus *de Monſtris, &c.*

vey'd firſt to *Paris*, and there bought by a Goldſmith of *Venice*; from whom at *Venice*, *Frederick* the Third, King of *Denmark*, purchas'd it, and added it to his Rarities.

2. Two Elephants Teeth, that weigh 150 Pounds apiece.

3 Several Heads of Hares, with divers ſort of Horns, brought out of *Saxony*.

4. An Egg, ſaid to be laid by a Woman, of the ordinary ſize of a Pullets Egg. This * *Ol. Wormius* tells us was ſent him by very good Hands, and confirm'd by People of Credit: He tells us, the Woman brought forth two, with the uſual Child-bed-labour Pains; her Neighbours being call'd in to her Aſſiſtance, the firſt they broke, and found a Yolk and a White, as in that of a Hen; the ſecond was kept and ſent to him.

*Muſ. Worm. *p.* M. 312. Joh. Rhod. *Cent.* 3. *obſerv.* 57.

5. The Horn of a Sea-Unicorn, or *Monoceros*, ſo called by the Learned, becauſe ſuppoſed to have but one: But ſometimes more are found to grow out of the upper Jaw; and I was credibly informed at *Copenhagen*, that one *Koens*, a *Hamburger*, brought home from *Greenland* the Head of one of theſe with two Horns on it. And when I ſaw this, and examin'd it well, I found this Horn (part of the Head and upper Jaw being brought home with it,) not to grow out of the Middle, but Left ſide of the upper Jaw; ſo that 'tis probable there was a fellow, and then they may be ſaid more properly to be his Teeth or Tusks than his Horns: Whether this was only a *Luſus Naturæ* or no, or naturally theſe carry only one Horn, as they are repreſented in the Cuts and Figures our Naturaliſts give us of them, I ſhall not determine.

6. Several Pieces of Gold-Oar very rich, and ſome almoſt fine, dug out of the Mines of *Norway* and *Hungary*.

7. Several large Pieces of Silver-Oar, dug alſo out of the Mines of *Norway*, one of which weigh'd five hundred and ſixty Pounds, *anno* 1666, five Foot and ſix Inches long, and four Foot about, valued at five thouſand Crowns: Another from *Norway*, alſo valued at three thouſand two hundred ſeventy two Crowns. I obſerv'd a great many Silver Threads or Trees ſprouting out of theſe two Pieces, and fanſy the whole Maſs had not above a fourth part of any baſer Metal, Mineral or Earth mixt with it. There are ſeveral of theſe Silver Ramifications or Trees, all from *Norway*, which I take to be Virgin-Silver and pure Metal.

8. A great variety of very large pieces of Amber; ſome dug out of the Iſland of *Anaker* near *Copenhagen*, and ſome when they were opening the Ditches for the Fortifications of *Copenhagen*: Some of theſe weigh about forty or fifty Ounces, and were found every where ſticking faſt to pieces of black Timber like Ebony.

9. A numerous Collection of very large Branches of Coral, white and red, and one black.

10. A large pair of Stags Horns growing out of a piece of Wood, after a very ſtrange manner.

11. Another Branch of a Stags Horn, with a large piece of Wood naturally adhering to the top of it; the top of the Horn piercing the very body of the Wood, and growing ſome Inches beyond it.

12. A Sheep, with a Horn growing out of its ſide about a Foot long.

13. I meaſured the Thigh-bone of a human Body, I ſuppoſe, that was three Foot and three Inches long; the Head was two Foot and five Inches round, and the middle of it was nineteen Inches and an half about.

14. Two very large Scollop Shells, that weigh two hundred and twenty four Pounds each.

15. A piece of Marble, with a natural Repreſentation of a Crucifix on its outſide, mightily valued by the *Lutherans*. And I remember Dr. *Hartman* ſhew'd me at *Koningsberg* in *Pruſſia*, a piece of whitiſh Amber, having a Woman with a Child in her Arms, prettily repreſented by variety of Colours on the Superfice; I ſuſpected it to be artificial, but he aſſured me the contrary, and kept it very religiouſly.

There were beſides theſe a great many more natural Rarities, which my ſhort ſtay there would not permit me to examine.

Among the Artificial Curioſities, I obſerv'd,

1. A Skeleton made of Ivory in imitation of a human Skeleton, two Foot and ſix Inches long, ſo artificially and curiouſly put together, that any one well skill'd in Oſteology may take it for a natural one.

2. Two Crucifixes of Ivory, with the whole Hiſtory of our Saviour's Paſſion, extremely well carved and expreſt, and are both a very pretty Curioſity. I ſaw there a great variety of Nicknacks made of Ivory, curiouſly wrought on the outſide: A ſmall Man of War of Ivory, with ſilver Guns in it; ſeveral ſmall Sloops and Galleys of the ſame, and one of the Unicorns Horn, with a gold Anchor.

3. A Watch made of Ivory, with all its Wheels and Motions. Several other Utenſils made of Ivory and Unicorns Horns, prettily carved and turn'd: Beſides ſome others of Ebony, Heart-Oak, Box, Amber, Silver, Braſs, *&c.* which are kept together for the Curioſity of the Workmanſhip.

4. In another Chamber there is nothing but the Garments, Arms, and Utenſils of *Indians*, *Turks*, *Greenlanders*, and other barbarous Nations, which for their number and variety entertain the Eye with a very agreeable pleaſure.

5. A Perſpective of the late King of *Denmark*'s Family, the Queen's Face being in the middle, and eight Princes and Princeſſes round her, yet all club to make the Face of the King, thro' a hole of a glaſs Tube.

6. Six golden ſepulchral Urns, found in the Iſland of *Fuenen*, *Anno* 1685, by a Boor there, as he was plowing his Land; they were full of Aſhes or a greyiſh Earth when found. The biggeſt is two Ounces and

an half, the other five about two Ounces and a Drachm. This confirms the accounts given us by *Saxo Grammaticus*, *Olaus Wormius*, and others, that it was a very ancient Cuſtom among the Northern Nations to burn their Dead, and then bury their collected Aſhes in golden Urns. They were very thin, and had three Rings of Gold round their Necks, and ſeveral Circles one within another, with one common Center carv'd on the outſide round the body of the Urn. They held between four and five Ounces of Liquids.

7. Another ſepulchral Urn of Cryſtal, of a conical Figure, found near *Bergen* in *Norway* about thirty Years ſince, with a gold Wire about it, that weighs eight Ounces.

8. I ſaw in another Chamber ſeveral *Urnæ Lacrymales*, in which were collected the Tears of Friends, which afterward the old *Romans* mix'd with the Aſhes of the Dead: Theſe were ſome of Glaſs, and ſome of Earth, and of ſeveral ſizes. Braſs Lamps of ſeveral Magnitudes and Shapes; ſome of other Metals, others of Earth, in the Shape of Animals or Idols, that were worſhipp'd by the Ancients. The *Stilus Æneus* of the *Romans*, the one end ſharp, the other blunt, the firſt to write with, the other to rub out what was written.

9. The large *Daniſh* Horn of pure Gold, weighs 102 Ounces and an half, is two Foot and nine Inches long, and holds about two Quarts of our Meaſure: This Horn was found *Anno* 1639, accidentally by a Country Girl in the Dioceſe of *Rippon* in *Jutland*: 'Tis no doubt, ſome *Runick* piece of great Antiquity by the Figures carv'd on the outſide, which ſeem to be Hieroglyphicks, monſtrous Shapes of Devils, Hobgoblins, *&c.* perhaps ſome of theſe might repreſent their Gods, and probably this Horn was uſed in their Sacrifices, as of old among the *Aſſyrians* and other ancient Nations, who were wont on ſolemn Occaſions to entertain the Croud with mighty noiſes of Horns and Trumpets, or rather to drink out of at their ſolemn Treats.

10. The *Oldenburg* Horn of pure Silver, gilt with Gold, and variouſly enamell'd with green and purple Colours, and weighs about four Pounds. The *Daniſh* Antiquaries ſay this Horn was given to Earl *Otho* of *Oldenburg*, *Anno* 989, but by the Workmanſhip of it 'tis plain it cannot be of that date; for the Figures and Characters engrav'd and emboſs'd on its outſide are modern; which, with the Enamelling and other Ornaments, all curiouſly done, pleaſe the ſight mightily, and make a very fine, as well as valuable Curioſity. I found in the ſame Chamber a great many Horns of this kind, ſome in Metal, ſome of Bullocks Horns tipp'd with Gold about the Edges, others of Ivory, Unicorns Horns, *&c.* all prettily wrought on the outſide with a great variety of emblematical Fancies, according to the humours of thoſe Countries and Times they were made in; which were ſo many Cups to drink out of at their ſolemn Entertainments; and this of *Oldenburg* was finer than the reſt, becauſe deſign'd for the Royal Table. 'Tis ſaid to be made by the Command of

Chriſtian the Firſt, who lived in the fifteenth Century, and did it in honour of the three Kings of *Cullein*.

I went one day aſhore on the Iſland of *Weenen*, which our Sailors call *Scarlet Iſland*, from a Tradition, that Queen *Elizabeth* offer'd as much Scarlet Cloath for it as wou'd cover it. This Iſland is now an appendix to *Schonen* in *Sweden*, not above half a League from the main Land. Here I obſerv'd the Ruins of *Tycho Brahe*'s Caſtle, which he built on this Iſland, given him by King *Ferdinand*, who ſupplied him with Money for the carrying it on in the Year 1567. This Caſtle was built in the middle of the Iſland, but is now demoliſh'd, and quite raz'd to the Ground, and all the Vaults and under-ground Works fill'd up except the large Obſervatory, which * *Gaſſendus* tells us, was diſtinguiſh'd from all the reſt of his Apartments under-ground, that were very many, by a ſolid round Stone Wall, part of which remains ſtill. This was his great Obſervatory, and was call'd by him *Stellæburgum*, or the City of Stars; as the Caſtle was *Uraniburgum*, or the City of the Heavens. The Situation was pleaſant no doubt, it being on a very little riſing ground, in the middle of a plain Iſland, not above three Miles round. The ſame Author tells us, the King of *Denmark*'s Liberality was ſo great towards this learned Man, that the beſt Workmen were employ'd about it, and every thing well contriv'd both for Pleaſure and Conveniences of Room, for Inſtruments and aſtronomical Obſervations above and under-ground, beſides noble Gardens, Fiſh-ponds and a Park: But by the Fate of War between *Sweden* and *Denmark*, ſometimes one being Maſter, and ſometimes the other, of this Iſland, no one Stone is left of this magnificent Superſtructure. His Inſtruments, that were very fine, are now ſcatter'd up and down in *Germany*, and ſome few remain in *Copenhagen*; his own cœleſtial Globe I ſaw there in the *Rown* Tower, which was ſix Foot and three quarters in diameter.

This Tower was built 1601, for the making aſtronomical Obſervations, near the Royal College in *Copenhagen*, and is above 150 Foot high, whoſe *Area* on the top is ſixty Foot diameter: The paſſage up to it is large enough for two Coaches, and the Aſcent ſo eaſy and hardly perceivable, that it ſerv'd for a place of Parade for their Gentry, when they had a mind to take the Air in their Coaches, riding up to the top, and ſo round the Ring, as well as for an Obſervatory. But Monſieur *Romer*, the great Mathematician and Aſtronomer of the preſent Age, has converted the upper part of this Tower now to other uſes, where in a dark Room he has his Inſtruments for obſervation. Here I ſaw his Machine for obſerving the Stars by day: There is a Pole eight or ten Foot long, erected perpendicular in the Center of an equinoctial Plain; on the top of this Pole is faſten'd a Teleſcope, not much above three Foot long, which runs thro' the Roof of the Chamber, whoſe Elevation is directed by an aſtronomical Dial upon the equinoctial Plain, with an Index fitted to it for that purpoſe, which determines it to the Star he has a mind to obſerve

* In Vit. *Tych. Brahe.*

at any time. He is ſaid to be the Inventer of two other Machines of great artifice and uſe: By the one he will ſhew at any time the Station of any Planet, according to the *Copernican* Hypotheſis; by the other he will demonſtrate all the Eclipſes of Sun or Moon paſt or to come.

There is beſides all theſe, in the King's Houſe in the Garden at *Copenhagen*, a Royal Throne all of Unicorns Horn, on which all the Kings of *Denmark* are ſeated at their Coronation; but this, when I was there, with the reſt of the Regalia, was ſecured and carried away, becauſe they wou'd have been too much expoſed had the King of *Sweden* bombarded this Town, as it was fear'd, when he landed on the Iſland, being but a little within the Wall towards the Land ſide.

In the Year 1685, I was at *Koningsberg* in *Pruſſia*, where I ſaw the Knife which was ſwallow'd by a *Pruſſian* Boor; who being Crop-ſick one morning, thruſt the Haft of his Knife down his Throat, in order to make himſelf diſcharge what offended his Stomach; but forcing the Knife too far, it ſlipt down his Gullet into his Stomach: from whence it was taken out by an Inciſion on the left ſide, a little below the ſhort Ribs, with that ſucceſs, that he lived ſeveral Years after it in very good health. This happen'd in the Year 1635. The Operation was perform'd by Dr. *Daniel Swab*, a Phyſician and Surgeon, and the Knife is kept in a velvet Bag in the King of *Pruſſia*'s Library, where I ſaw it. I meaſured it by an *Engliſh* Foot Rule I had then in my Pocket, and found it to be of our meaſure but ſix Inches and about an half long, as 'tis expreſs'd in the Cuts given us of it. I made enquiry concerning it, and was very well aſſured by ſeveral People of the Town the matter of fact was true; and 'tis hard to think, the King of *Poland*, who was then at *Koningsberg*, the Government of the City, and the College of Phyſicians, who were conſulted upon the Operation, and, together with his *Poliſh* Majeſty, were Eye-witneſſes of it, ſhou'd by the Certificates they have publiſh'd of it in Print, contrive to impoſe a Cheat upon the World. And I remember, talking one day with one Mr. *Taylor*, a *Scotch* Merchant in *Koningsberg*, he told me, that *Andrew Grunheide*, for that was the Man's Name, was his particular Friend and Acquaintance; that he ſaw his Wound ſeveral times when his Surgeons dreſs'd him, and was Godfather to one or two of his Children after his Recovery.

When I was laſt in *Amſterdam*, I had the curioſity to go to a Tavern, where the Maſter was very curious in Birds, and had a great variety of ſome very uncommon ones; amongſt which, in a Chamber by it ſelf, he ſhow'd me a Cage with a Bird in it a little bigger than a Capon, which he valued as a great Rarity, and told me it coſt him near one hundred Pounds Sterling: He takes a Groat from every body that is admitted to ſee it. I muſt needs ſay I never ſaw a more beautiful Creature in all my Life; in Body ſomewhat like a Hawk, but its Head and Neck bald like a Vulture, only a few ſhort Feathers over his Eyes like Eye-brows, his Eyes were pretty large, and the *Iris* of a very fine bright Pearl Colour, which gave great Beauty to this Bird. The Colour of his Feathers is ſo curiouſly mixt with that Variety that no Painter can imitate them, and entertains the Eye with a great deal of Pleaſure: His Bill and Head in ſhape are more like the Eagle than the Vulture, tho' I take it to be of the Kind of the latter, but of the leſſer ſort. This Bird came from *Carthagena* in *America*, and may be deſcrib'd thus: *Vultur Americanus minor Carthagenæ Corpore eleganti & plumis admodum concinne variegatis.* I preſume this Bird can hardly be of the ſame Kind with thoſe Vultures *Monardes* tells us of in the Iſlands near *Lima* in *Peru*, that prey'd on their living Cattel in the Fields, if not carefully watch'd by their Keepers.

I did not ſee the Cherry-ſtone in the King of *Denmark*'s Cabinet, which I was told had ſome hundreds of Heads engraved on the outſide of it; but I remember an *Engliſh* Gentleman ſhew'd me once in *Holland*, in the Year eighty ſeven, a Cherry-ſtone of this Kind with an hundred and twenty four Heads on the outſide of it, ſo that you might diſtinguiſh with the naked Eye, Popes, Emperors, Kings and Cardinals, by their Crowns and Mitres. 'Twas bought in *Pruſſia*, where it was made for three hundred Pounds *Engliſh*, and is now in *London*, there having been a Law-ſuit not long ſince commenc'd about it in *Chancery*.

Of the Bramines *in the* Eaſt-Indies, *by Mr.* John Marſhall, *n.* 268. *p.* 729.

IX. The Prieſts, or *Bramines*, and Holy Men, whom they call *Jogees*, when they have Occaſion to write any thing they always put a Figure of one in the firſt place, to ſhew, as they ſay, that they acknowledge but one God, who they ſay is *Burme*, that is, Immaterial. When they preach to the People, and inſtruct them, which is commonly every Feaſt-day, Full Moon, or the time of an Eclipſe of either Luminary, they tell the common People much of God, Heaven and Hell, but very Imperfectly, Obſcurely, and Myſtically. They ſay that when God thought of making the World, he made it in a Minute. They account this World the Body of God, for all that they ſay he's Immaterial; and ſay that the Higheſt Heavens are his Head, the Fire his Mouth, the Air his Breath and Breaſt, the Water his Seed, and the Earth and the Foundations thereof his Legs and Feet. But aſſert in general that God is the Life of every thing, yet is the thing neither greater nor leſs for him. They hold that God dwelt in a Vacuity before that he created the World, and that as he dwelt in that Vacuity he created ſeveral Beings out of himſelf, the firſt were Angels, the ſecond Souls, the third Spirits, all differing in Degrees of Purity, the firſt being more pure than the ſecond, and the ſecond than the third. The Angels, they ſay, neither act Good nor Evil, the Souls either Good or Evil, but the Spirits, or *Dewta's*, as they call them, act ſcarce any thing but Evil.

They have a good Opinion of the Angels, and think their State mighty happy, hoping that when they die they ſhall be made Partakers of the ſame Bliſs and Pleaſure. They believe that every thing that hath Life hath a

Soul, but eſpecially Man; and they accordingly affirm, that as theſe Souls behaved themſelves in their pre-exiſtent State, ſo are their Actions in this World either good or bad, by a ſort of fatal Neceſſity, which is very hard to conquer, or to overcome. Hence it is, ſay they, that there are ſo many different Humours and Diſpoſitions of Men; for their Souls, before their Entrance, into their Bodies, being tainted with different Affections, cauſes the like Differences in the Parties, whoſe Bodies are their Vehicles. So that if a Man happen to have a ſudden or unfortunate Death, they immediately aſcribe the ſame to the Party's own Wickedneſs, or the bad Life that his Soul led before that it enter'd into his Body. For, ſay they, the afore-acted Evil that his Soul did in its other Life, brought theſe Accidents upon him, by getting the upper hand of him, and by being too powerful and ſtrong. And thoſe that dye thus, they believe that their Souls turn immediately into Devils. They maintain *Pythagoras*'s Tranſmigration, or *Metempſychoſis*, but in a groſſer Senſe than he did. For they believe that Mens Souls, that have not lived ſo well as they ought, go as ſoon as the Body dyes not only into Birds and Beaſts, but even into the baſeſt Reptiles, Inſects and Plants, where they ſuffer a ſtrong ſort of Purgation, to expiate their former Crimes: But as for the Souls of the *Jogees*, or *Fuche's*, that is, of Religious Men and Saints, they fanſy that they go and inhabit with the good *Dewta*'s, or Angels, amongſt the Stars. As for the Spirits, or Inferiour Angels, they believe that they are very evil, and have a hand in all Wickedneſſes, Murders, Wars, Storms, and Tempeſts; ſo that when they ſolemnize the Funerals of thoſe that are dead, they alway preſent Diſhes of Meat, as Offerings unto thoſe Spirits, and ſometimes ſacrifice unto them, that they may not hurt the Souls of the Dead.

As they acknowledge the Being of a mighty God, ſo they hold that he created the World, and every thing therein. They believe that there are almoſt infinite Number of Worlds, and that God has oftentimes Annihilated, and Re-Created the ſame. But how he came firſt to create the World and Mankind, they relate to have been thus—Once on a time (ſay they) as he was ſet in Eternity, it came into his Mind to make ſomething, and immediately no ſooner had he thought the ſame, but that the ſame Minute was a perfect beautiful Woman preſent immediately before him, which he called *Adea Suktee*, that is, the firſt Woman: Then this Figure put into his Mind the Figure of a Man; which he had no ſooner conceiv'd in his Mind, but that he alſo ſtarted up, and repreſented himſelf before him; this he called *Manapuiſe*, that is, the firſt Man; then upon a Reflection of theſe things, he reſolv'd further to create ſeveral Places for them to abide in, and accordingly aſſuming a ſubtil Body, he breathed in a Minute the whole Univerſe, and every thing therein, from the leaſt to the greateſt.

They conſtantly believe that the Univerſe cannot poſſibly laſt longer than ſeventy one *Joogs*, which is a Meaſure of time with them, and is . . . . Years. Which when it is come, God does not only annihilate the whole Univerſe, but even every thing elſe, as well Angels, Souls, and Spirits, as Inferiour Creatures; and then he remains in the ſame ſtate that he was in before the Creation; But ſay, that after he has a while reſpired thus, he breathes again, and every thing is Created afreſh, as well Angels and Souls, as all other things; but as for the Spirits, they are no more thought of. Yet for all this, after ſeventy one *Joogs* more all is annihilated again. How many *Joogs* are paſt ſince the World was laſt created they cannot certainly tell; only 'tis obſervable that in an Almanack of theirs, written in the *Sanſcript* Language in 1670, they make the World then 3892771 Years old from its laſt Creation.

The *Bramines* of *Perſia* tell certain long Stories of a great Giant that was led into a moſt delicate Garden, which upon certain Conditions ſhould be his own for ever. But one Evening in a cool Shade, one of the wicked *Dewta's*, or Spirits came to him, and tempted him with vaſt Summs of Gold, and all the moſt precious Jewels that can be imagined; but he couragiouſly withſtood that Temptation, as not knowing what Value or Uſe they were of: But at length this wicked *Dewta* brought to him a fair Woman, who ſo charm'd him, that for her ſake he moſt willingly broke all his Conditions, and thereupon was turned out. They tell a great many Stories, abſurd and ridiculous enough, of the firſt Ages of this preſent World, which would be too tedious here to take notice of; only I ſhall here give you out of one of their own Books what they tell us of a great Flood that formerly happened. They ſay that about 21000 Years ago the Sea overwhelmed and drowned the whole Earth, except one great Hill, far to the Northwards, called *Bindd*, and that there fled thither only one Woman and ſeven Men, the Names of whom were, *Dehoolah*, *Sunnuk*, *Sunnaud*, *Trilleek*, *Sannotah*, *Cuppyloſhaw*, *Suraſchah* and *Burroopung*; theſe, underſtanding out of their Books that ſuch a Flood would come, and was then actually coming, prepar'd againſt the ſame, and repair'd thither; to which Place alſo went two of all ſorts of Creatures, Herbs, Trees, and Graſſes, and of every thing that had Life, to the Number in all of 1800000 living Souls. This Flood (ſay they) laſted 120 Years, five Months and five Days: After which time all thoſe Creatures that were thus preſerved, deſcended down again and repleniſhed the Earth: But as for the ſeven Men and Woman, only one of them came down with her, and dwelt at the Foot of the Mountain, the other ſix turned *Fuchee's*, or holy Men, and ſpent there the Remainder of their Days. They hold in general the *Ptolemaick* Syſtem of the Univerſe, and ſay that there are eight or nine Heavens, counting the Air and Earth, every one exceeding another in Beauty and Glory. Their Religion conſiſts of nothing that I could ever ſee or learn, but the leading of a pure Life, the waſhing away of their Sins in the River *Ganges*, their muttering over of diverſe Prayers, and their doing of ſtrange and incredible Penances. They ſay, that God is ſuch a one, that whoſoever ſeeks him, let it be after what manner he pleaſes, whether by thinking that the Sun is he, or the Moon, or the like, if they do it but ſincerely and honeſtly, with a right affected Heart, they ſhall be received of him. They report, that on a time a *Muſſulman* ſeeing a *Hindoo*, or Pagan Prieſt, in Heaven, he ask'd God how that Infidel came to have Admittance thither; whom *Mahomet* ſo often calls by the Name of Bitter Roots? To whom God anſwer'd, What if a Bitter Root bring forth ſweeter Fruit than any of you, why ſhould I not receive it? Upon which the *Muſſulman* had no more to ſay. They hold, that ſuch as ſuffer not their Minds to wander after the Luſts of the World are perfect *Jogees*, or Saints, and hold that God is always preſent with them in all their Actions.

It is to be found in many of their Books, that there was a time, a good while ago, in which God took upon him the Shape of a Man, and ſpent many Years in reforming the World, and giving better Rules to walk by than had been before: but at length having left them, they ſoon forgot him and his Rules, and return'd to their former Courſes; upon which he told them that he would leave them to their own Ways, and never undertake any ſuch thing again.

The Religious at ſome certain Seaſons of the Year come unto the River *Ganges*, (which they call the Holy River,) in vaſt Multitudes, even from many Parts of *Tartary*, to waſh away their Sins, and make Expiation for their Faults. This *Ganges* is a delicate fine River, chiefly for the ſake of its moſt ſweet, pure, and clear Waters, which have got it the greateſt Eſteem of any River in the Eaſt. I have oftentimes ſail'd many Miles up it, and have found it in ſome Places not to be above a Mile broad, in others not half ſo much, and in one or two Places not above one eighth of a Mile. In *April*, when the Water is at the loweſt, it is almoſt dry in many Places; but when it is at the higheſt, which is commonly about the middle of *September*, it is very deep, and many Miles broad. When the People are here gather'd together, they have a great many ſtrange Cuſtoms and Ceremonies, and pay a Kind of Divine Honour and Worſhip to the River, too long and tedious here to mention. The *Hindoo's* and *Bramines* preach then every Day to the People, teaching them their Duties, and ordering them to ſay ſuch and ſuch Prayers; but above all things to be Charitable to the poor and needy.

It is reported, that upon the Hills by *Caſmere* there are Men that live ſome hundreds of Years, and can hold their Breaths, and lie in Trances for ſeveral Years together, if they be but kept warm; and that every Year ſome of them come down unto the People at *Ganges*, and do many great Cures; for whom they have ſuch a Veneration, that they frequently drink the Water they waſh their ſweaty Feet in. The Penances and Auſterities that they undergo are almoſt incredible; moſt of them, through their continual Faſting, and lying upon the parching hot Sand in the Heat of the Sun, are ſo lean dry'd and wither'd, that they look like Skeletons or Shadows, and one can ſcarce perceive them to breathe, or feel their Pulſe beat.

When any great Man dies amongſt them, but eſpecially any of their *Jogees*, or Saints, they make great Preparations for their Funeral; the Corpſe is laid on its Belly, and Salt and Rice round about it at every Corner on the Ground. Then the neareſt Relations to the Party deceaſed carry a Pot of Water on their ſhoulders ſeveral times about the Funeral Pile, when they burn them, then breaking it in Pieces, ſpills the Water. Which Ceremony being ended, the Pile is fired, and then all the Relations begin to howl, and embrace one another, then waſhing themſelves in ſome neighbouring River, they depart every one to his home; and as for the remaining Aſhes, if he be rich they gather them up and caſt them into the *Ganges* or the Sea. Sometimes it happens that the Wife of the deceaſed Party, if ſhe have no Children, and be old, or ill to live in the World, will burn herſelf with the dead Body; but this happens very ſeldom. It is ſaid, that in ſuch Caſes the *Bramines* give the Woman a ſtupifying Liquor, which by the time that they are in the Fire makes them ſenſeleſs of any Pain. To know into what Body the Soul of the deceaſed is tranſmigrated they do thus; they ſtrew the Aſhes of the dead upon the place where he was firſt laid after his death, and handfuls of odoriferous Flowers about the ſame, and returning again in forty four Hours, they judge by ſome pretended impreſſion or other in the Aſhes, into what body it is gone: if the Foot of an Horſe, or Dog, or Ox, or ſuch like appear, then they certainly give out that it is gone into ſuch like Creature; but if nothing appear, then they think it is certainly gone to the ſtarry Regions.

As for their Learning and Knowledge it is but little; they have indeed ſeveral Books writ in diverſe Languages, tho' they contain nothing but a great deal of ſtuff and cant about their Worſhip, Rites and Ceremonies. They are ignorant of all parts of the World but their own; they wonder much at us, that will take ſo much care and pains, and run thro' ſo many dangers both by Sea and Land, only, as they ſay, to uphold and nouriſh Pride and Luxury. For, ſay they, every Country in the whole world is ſufficiently endow'd by Nature with every thing that is neceſſary for the life of Man, and that therefore it is madneſs to ſeek for, or deſire, that which is needleſs and unneceſſary.

The laſt time that I was at *Moduſſerpore* in *Indoſtan*, I had a great deal of talk with a *Bramine* ſomewhat more learned than any of the reſt, his name was *Ramnaunt*; he told me a great many Secrets in Phyſick, and many Traditions and Stories. He ſays, that if you bury a piece of Money for ſome conſiderable time in the mouth of a live Frog, and then dig it up again at midnight, that this piece of Money, to whomſoever you give or pay it, will always return to you again. He ſays, that if the little Worm in the Wood *Lukerakera* be cut in two, and the one part ſtirs and the other not, if the ſtirring part be bruiſed, and given with half a Beetle to a Man, the other half to a Woman, this Charm will keep them from ever lying abſent one from the other. They have Books full of the like abſurdities, and caballiſtick Complication of Figures;

gures; as for example, if you write theſe following Numbers, 28, 35, 2, 7.—6, 3, 32, 31—34, 29, 8, 1,—4, 5, 30, 33. in the ſquares of a ſquare Figure, and your Enemies name under it, and wear it always about you, your Enemy ſhall never be able to hurt you. So if you write the following Figures in the like manner upon the left hand, 2, 9, 2, 7—6, 3, 6, 5,—8, 3, 8, 1—4, 5, 4, 7—with Turmeric, and waſh the ſame off with fair Water of *Ganges*, and drink it, it will cure all manner of venemous Bitings. Multitudes of ſuch like ridiculous fancies they have; all which they ſeem to have borrowed from the *Cabala* of the *Saracens*, which is full of ſuch like.

I lately heard a *Bramine* ſay, that if ſome of the pieces or knots of the Cloaths (in which a Woman hath been burned with her Husband) be ſaved, and made up in form of a Wick, and fitted for a Lamp, and lighted, and ſet in a dead Woman's Skull, that it would make the dead party appear. This he ſaid he had done, but I did not believe him. When they have any mad men amongſt them, they take them, and put them into a cloſe Room, juſt big enough to hold them, and almoſt ſmoke them to death with Musk and cold Smells, which ſoon brings their brains into their right temperature, and ſo recovers them, &c. There happened two things in our Voyage hither which I thought very obſervable; The firſt was, that all our Tornadoes brought much Rain with a ſtink; and if the Seamen did but lay their Cloaths by for twenty four Hours, they became all full of little Maggots. The ſecond is, When we came out of *Europe* we took in ſome Water at St. *Jago's*, and when we were almoſt at our Journeys end, our Cooper going with a Candle to open one of the Casks, he had no ſooner done it, but the Water immediately took fire, and burnt his Face, Hands and Fingers; but he ſuddenly turning about quench'd the ſame, by ſetting his Breech on it. It ſtunk pretty much alſo at the ſame time, but afterwards came to its native ſweetneſs, &c.

A Voyage to the Iſland of Chuſan, *by Mr.* Cunningham. *n.* 280. *p.* 1201.

XI. We ſtay'd at the Iſland of *Borneo* but two Days, the Seaſon of the Year being ſo far paſt, and from thence made the beſt of our way through the Streights of *Banca* with favourable Winds and Weather, till we came on the Coaſt of *China* the 13th of *Auguſt*, then we had variable Winds which carried us abreſt of *Emuy* the 19th following, at which time the North Eaſt Winds ſetting in freſh, put us in great fears of loſing our paſſage; whereupon we were forced to turn it up againſt Wind and Current all the way, the Weather ſo favouring us, that we were never but by our Topſails, elſe we ſhould have loſt more Ground in one Day, than we could have gain'd in eight. The laſt of *Auguſt* we came to an Anchor under the *Crocodile* Iſlands, both to ſhelter us from the bad Weather, (which is generally expected on this Coaſt at new and full Moon, and has been fatal to a great many Ships) and alſo to look for freſh Water, which was now grown ſcarce with us, not having re-

cruited

cruited ſince we came from the Cape of *Good Hope*: Theſe are three ſmall Iſlands lying in the Latitude of twenty ſix Degrees, about ſix Leagues from the River of *Hockſieu*; on *two* whereof we found very good freſh Water, with a convenient watering place on the South Weſt ſide of the innermoſt of the *three*, and by the aſſiſtance of a few *Chineſe* Fiſher-men we procured ſome freſh Proviſions from the main-land, becauſe we did not reckon it ſafe to adventure our ſelves thither, leſt we ſhould have been brought into trouble by the Government there. While we lay here, on the 5th of *September* we had a ſudden ſhort ſhift of the Monſoon to S. W. the fury whereof others felt, in coming upon the Coaſt of *China* at the ſame time. The 8th of *September* we put to Sea again, turning to Windward Night and Day without all the Iſlands, which are very numerous along this Coaſt, to which we were altogether ſtrangers beyond *Emuy*, and the Hydrography thereof is hitherto ſo imperfect, that there was no truſting to our Drafts, which made our Navigation ſomewhat more dangerous: However, on the firſt of *October* we got into the Latitude of thirty Degrees, where we came to an Anchor near the Land, until we found the way by Boat to *Chuſan*, about twelve Leagues within the Iſlands; from whence we had a Pilot, who carry'd us ſafely thither on the 11th of *October*. Upon this Iſland the *Chineſes* have granted us a Settlement and Liberty of Trade, but not to *Ning-po*, which is ſix or eight Hours ſail to the Weſtward, all the way amongſt Iſlands; this being the largeſt, is eight or nine Leagues in length from Eaſt to Weſt, and four or five Leagues in breadth; about three Leagues from that point of the Main-Land called Cape *Liampo* by the *Portugueſe*, but *Khi-tu* by the *Chineſe*: At the Weſt-end of this Iſland is the Harbour, very ſafe and convenient, where the Ships ride within call of the Factory, which is built cloſe by the Shore on a low plain Valley, with near 200 Houſes about it for the benefit of Trade; inhabited by Men, whoſe Jealouſy has not as yet permitted them to let their Wives dwell here; for the Town where they are, is ¾ of a Mile further from the Shore, environ'd with a fine Stone Wall, about three Miles in Circumference, mounted with twenty two ſquare Baſtions placed at irregular diſtances, beſides four great Gates, on which are planted a few old Iron Guns, ſeldom or never uſed: the Houſes within are very meanly built: Here the *Chumpeen* or Governour of the Iſland lives, and betwixt three and four thouſand beggarly Inhabitants, moſt part Soldiers and Fiſhermen; for the Trade of this place being newly granted, has not as yet brought any conſiderable Merchants hither. The Iſland in general abounds with all ſorts of Proviſions, ſuch as Cows, Buffalo's, Goats, Deer, Hogs wild and tame, Geeſe, Ducks and Hens; Rice, Wheat, Calavances, Coleworts, Turnips, Potatoes, Carrots, Beetes and Spinach; But for Merchandize there's none but what comes from *Ning-po*, *Hangcheu*, *Nankin*, and the Inland Towns, ſome of which I hope to ſee, when I have acquir'd a little of the *Chineſe* Language. Here alſo the Tea grows in great plenty on the tops of the Hills, but it is not in that eſteem with what grows on more mountainous Iſlands. Altho' this Iſland is pretty well ſtor'd with People, yet it's far from what it was in *F. Martinius*'s Time, when he deſcribes *Cheuxan:* and this put me in mind, that the ſuperſtitious Pilgrimages thereto, mention'd by him, muſt be meant of the Iſland *Pouto*, which lies nine Leagues from hence, and three Miles to the Eaſtward of this Iſland, whither (they ſay) the Emperor deſigns in the Month of *May* next (being his Birth-day, and the fortieth Year of his Age) to come to worſhip in an ancient Pagod there, famous for Sanctity; having ſent one of his *Bonzes* already thither, to get all things in order.

2. I formerly told you, that the Emperor deſign'd to have come to the Iſland of *Pou-to* (a place of great Devotion) to worſhip in the Month of *May* laſt, being the fortieth Year of his Age, I ſhould have ſaid of his Reign; but all things being prepared there for his reception, he was diſſuaded from his purpoſe by ſome of his *Mandarins*, who made him believe that the terrible Thunder there was very dangerous. This *Pouto* is a ſmall Iſland about five Leagues round at the Eaſt end of this Iſland, famous for the ſuperſtitious Pilgrimages made thither for the ſpace of eleven hundred Years: it's inhabited only by *Bonzes*, to the Number of three thouſand, all of the Sect call'd *Hoſhang*, or unmarried *Bonzes*, who live a *Pythagorean* Life; and there they have built four hundred Pagodes, two whereof are conſiderable for their Greatneſs and Finery, being lately covered with green and yellow Tiles brought from the Emperor's Palace at *Nankin*, and inwardly adorn'd with ſtately Idols finely grav'd and gilded, the chief whereof is the Idol *Quon-em*. To theſe two great Pagodes belong two chief Prieſts, who govern all the reſt. They have ſeveral Ways and Avenues cut through the Iſland, ſome whereof are pav'd with Flag-ſtones, and overſhaded with Trees planted on each ſide: their Dwellings are the beſt I have yet ſeen in theſe parts. All which are maintain'd by charitable Devotions; and the Junks which go from *Ning-po* and this place to *Japan*, touch there both going and coming, to make their Offerings for their good ſucceſs. There is another Iſland call'd *Kimptong* five Leagues hence in the way to *Ning-po*, whither, they ſay, do retire a great many *Mandarins* to live a quiet Life after they have given over their Employments; on that Iſland alſo are ſaid to be Silver Mines, but prohibited to be open'd. The reſt of the circumjacent Iſlands are either deſert, or meanly inhabited by a few fiſhing People, but all of them ſtor'd with abundance of Deer. For it is not long ſince this Iſland of *Chuſan* began to be peopled; it's true, in *Martini*'s Days, about fifty Years ago, it was very populous for the ſpace of three or four Years, at which time the fury of the *Tartarian* Conqueſt was ſo great, that they left it deſolate, not ſparing ſo much as the Mulberry Trees (for then they made a great deal of raw Silk here) and in this condition it continued till about eighteen Years ago, that the Walls

of the Fort or Town, which now is, were built by the Governour of *Ting-hai*, for a Garriſon to expel ſome Pyrate, who had taken ſhelter here. About fourteen Years ago, the Iſland beginning to be peopled, there was a *Chumpeen* or General ſent to govern it for three Years, to whom ſucceeded the late *Chumpeen* (who procur'd the opening of this Port to ſtrangers) whoſe Government continued till *April* laſt, being tranſlated to be *Chumpeen* of *Tien-cing Wei* near to *Pekin*, and was ſucceeded by the preſent *Chumpeen* who is Son to the old *Chunkoon* of *Emuy*. They have got no Arts or Manufactories here, but making of lacker'd Ware, a particular Account whereof I cannot as yet ſend you. They begin to plant Mulberry-Trees, to breed up Worms for the production of raw Silk; and they make ſome Tea, but chiefly for their own uſe.

The three ſorts of Tea commonly carry'd to *England* are all from the ſame Plant, only the Seaſon of the Year, and the Soil makes the difference. The *Bohe*, (or *Voiii*, ſo call'd of ſome Mountains in the Province of *Fokien*, where it is chiefly made) is the very firſt bud gather'd, in the beginning of *March*, and dry'd in the ſhade. The *Bing* Tea is the ſecond growth in *April:* and *Singlo* the laſt in *May* and *June*, both dry'd a little in *Tatches* or Pans over the Fire. The Tea Shrub being an ever-green, is in Flower from *October* to *January*, and the Seed is ripe in *September* and *October* following, ſo that one may gather both Flowers and Seed at the ſame time; but for one freſh and full Seed, there are a hundred naught; theſe make up the two ſorts of Fruit in *Le Compte*'s Deſcription of Tea: as for his other ſort, which he calls ſlymic Peaſe, they were nothing but the young Buds of the Flowers not yet open. Its Seed-Veſſels are really *Tricapſular*, each *Capſula* containing one Nut or Seed, and altho' two or one *Capſula* only comes to perfection, yet the Veſtiges of the reſt may be diſcerned. It grows in a dry gravelly Soil, on the ſides of Hills in ſeveral places of this Iſland, without any cultivation.

* p. 96. * *Le Compte* is miſtaken in ſaying that the *Chineſes* are wholly ſtrangers to the Art of Grafting, for I have ſeen a great many of his paradoxical Tallow-Trees ingrafted here, beſides ſome other Trees. When they ingraft, they do not ſlit the Stock as we do, but cut a ſmall ſlice off the outſide of the Stock, to which they apply the Graft (being cut ſloping on one ſide, agreeable to the Slice cut from the Stock) bringing up the Bark of the Slice upon the outſide of the Graft, they tie all together, covering with Straw and Mud as we do. The *Chineſe Che* or Cubit is of two ſorts, one of thirteen $\frac{7}{10}$ *Engliſh* Inches, which the Merchants commonly uſe: the other is of eleven Inches, us'd by Carpenters, and alſo in Geographical Meaſures.

Having made enquiry about *Martini*'s Account of ſowing their Fields at *Ven-cheu* with Oyſter-ſhells, to make new ones grow; I was told that after they have taken out the Oyſters, they ſprinkle the Shells with Urine, then putting them into the Water again, there grow new Oyſters on the afore ſaid Shells. The *Fula Mogorin* of the *Portugueſe*, I'm ſure is the ſame with the *Syringa Arabica flore pleno albo* Parkinſon. All the *Kicu-yeu* or Tallow-Trees that I have ſeen here bear a ſpike of ſmall yellow Flowers like the *julus* of a *Salix*. The Bean, or *Mandarin* Broth, ſo frequently mention'd in the *Dutch* Embaſſy and other Authors, is only an Emulſion made of the Seed of *Seſamum* and hot Water.

Their chief Employments here are Fiſhing and Agriculture. In Fiſhing, they uſe ſeveral ſorts of Nets and Lines as we do; but becauſe they have large Banks of Mud in ſome places, the Fiſherman, to go more eaſily thereon, has contriv'd a ſmall Frame about three or four Foot long, not much larger than a Hen-trough, elevated a little at each end, in which he reſts upon one Knee, leaning his Arms on a croſs Stick, rais'd ſo high as his Breaſt, and putting out the other Foot often upon the Mud, he puſhes forward his Frame thereon, and ſo carries himſelf along in it.

As to their Agriculture, all their Fields (where any thing is planted) whether high or low, are made into ſuch Plots as may retain the Water on them when they pleaſe. They plow up their Ground with one Buffalo or one Cow. Where they are to ſow Rice, they prepare the Fields very well, by clearing it of all manner of Weeds, moiſtning to a pulp, and ſmoothing it with a Frame drawn acroſs; on which they ſow the Rice very thick, and cover it only with Water for two or three Inches high, and when it has grown ſix or eight Inches long, they pull it up by the Roots, and tranſplant it (by Tufts in a ſtreight Line) to Fields overflown with Water; and where a Field is ſubject to Weeds, when the Water dries up, they prevent their Growth in overturning the Mud with their Hands in the Interſtices where the Rice is planted. When they ſow Wheat, Barley, Pulſe, and other Grains, they grub up ſome ſuperficial Earth, Graſs and Roots, and with ſome Straw they burn all together; this Earth being ſifted fine, they mix with the Seed, which they ſow in Holes made in a ſtreight Line, and ſo it grows up in Tufts as the Rice does; the Field being divided into Beds and harrowed over, both before and after the Seed is ſown: This makes them ſomewhat reſemble Gardens. Altho' they meliorate their Fields where they ſow Rice, only by letting the Water on them, yet for other Grains, where ground requires it, they make uſe of Dung, human Excrements, Aſhes, *&c.* In watering their Fields here they uſe the ſame Inſtrument mention'd by *Martini* in the Preface to his Atlas, being all of Wood, and the contrivance the ſame with that of a Chain-Pump.

Their method in making of Salt is this: All the Shores here being Mud, inſtead of Sand, in the Summer Seaſon they pare off the ſuperficial Earth, which has been overflown with the Salt Water, and lay it up in heaps for uſe; when they are to uſe it they dry it in the Sun, rubbing it ſmall; then digging a Pit, they cover the bottom thereof with Straw, at which through the ſide of the Pit they paſs a hollow Cane, that leads into a Jar, which ſtands below the Level of the Pits bottom; they fill the Pit almoſt full with the aforeſaid Earth, and pour Salt Water thereon till it be covered two or three Inches with Water, which drains through, into the aforeſaid Jar, and is afterwards boil'd into Salt.

I have ſeen a ſingular Root ſince I came here call'd *Hu-chu-u* (which I take to be the ſame) whereto they aſcribe wonderful Properties of prolonging Life, and turning grey Hairs into black, by drinking its Infuſion for ſome time, inſomuch that they ſay 'tis to be had in value from ten Tael to one or two thouſand a ſingle Root; for the larger it is, the more is its Value and Efficacy; which is too much Money here to try the Experiment.

Obſervations on Ceilan, *by Mr.* Strachan. *n.*287.*p.*1094.

XI. The way they catch Water-Fowls is this. In Loughs and Waters which are not very deep, the Fowler puts an earthen Pot upon his Head, in which Pot are bored holes, through which he may ſee; then he wadeth in the Water, nothing being ſeen but the Pot which covereth his Head, and thus enters in the midſt of all the Fowls, they thinking it to be a Block or the like driving do not take notice of it, although it be upon their ſide; then he takes hold of one by his Foot, and draws him under Water, and wrings his Neck about; the reſt of the Fowls, not perceiving this, ſit ſtill, then he goes to the next Fowl and does the ſame; and ſo going forth he catches as many as he pleaſes. Thoſe that have Guns, make a Frame, which they cover with green Branches, which are ſo broad as to cover their whole Body. They ſtand behind it; then carrying the Frame before him, the Bird or Deer ſeeing nothing but the green Branches is not affrighted, and thus the Hunter being advanced near enough, gives fire.

It is wonderful to conſider, how ſome Beaſts are affrighted by Fire, as Lions, Tigers, Wild Swine, and other Beaſts; and as the *Ceilaneſes* chaſe the Elephants, Wild Swine and Tigers from their Plantations by Fire, and the Natives at the *Cape of Good Hope* chaſe the Lions from their Cattel; ſo alſo do the *Ceilaneſes* catch Harts, Deers, Elks, and Hares, which they perform in this manner. In time of the Night two Men go into the Wood, one of theſe takes an earthen Veſſel upon his Head, wherein is Fire burning, made of Sticks and a kind of Reſine, and in one Hand he carries a Staff, whereon are faſtned eight Bells, which the more harmonious they are, ſo much the better, the other Man goes behind with a Spear in his Hand; whenever the Deer perceiveth the Light and hears the Bells, he draws near to it, ſtanding and beholding it as amazed, for he ſees not the Men; in the mean time the Man with the Spear pierceth his Body, and catches him. Now Elephants, Tygers, Serpents and Wild Swine run when they ſee the Fire, ſo that the Hunters need not fear them.

There are two ſorts of Serpents that Capt. *Knox* does not mention, which are thought not to be venemous, and a *Ceilaneſe* will not kill; the firſt is of a bluiſh Colour, and comes frequently into Houſes, and ſearches for Rats only, and eats them; he creeps into their Neſts, and makes a Deſtruction among them; he is of the Thickneſs of an Inch and a half Diameter, and about two Yards and a half long. The other is green like a Leaf of a Tree, who winds himſelf, and climbs upon the Trees, and catches the Birds, lying ſtill all the time as if he had no Motion, until he ſees a fit Opportunity to catch. He is about one half Inch Diameter, and a Yard long.

The *Talgoi* will lie as if he were dead beſide theſe little Neſts which are built by theſe Ants called *Waia*, letting his Tongue ſtick out as far as he can; theſe Ants will immediately fix themſelves in great Numbers round about and upon his Tongue, to carry away the Slime which is upon the Tongue, thus he draws in his Tongue and ſwallows them, and then he ſhoots forth his Tongue again, and continues ſo to do until he has ſatisfied his Hunger.

If a Man be lying or ſleeping, an Elephant will not mind him. A Company of *Dutch* Soldiers marching from *Columbo* to *Gurbewil*, one of them did ſtay behind to reſt himſelf, and did ſlumber upon the way-ſide. An Elephant coming out of the Woods, went within two Paces of him, but when he was paſſed by about ſeven or eight Paces, the Souldier did awake and ſee the Elephant, and not thinking it ſafe to run, becauſe the Elephant did not mind him, lay ſtill until he perceived the Elephant to be gone.

There are two ſorts of Cinnamon-Trees, of which the Tree which is eſteemed the beſt has a Leaf much larger and thicker than the other, but otherwiſe no Difference is perceived. If theſe Leaves, as well one ſort as the other, be diſtilled, they yield an Oyl and Water, as if Cloves had been in the Still. Upon the Root of this Tree is a thick Bark, which, when it is diſtilled, as the former, yields Oyl and Camphire alſo; which is ſeparated by covering the Receiver with a Linen Cloath, and the Camphire will remain in the Cloth in a Lump together, and the Oyl and Water will run into the Receiver. This Camphire has the ſame Colour, the ſame diſcuſſing, diſſolving and healing Balſamick Quality of the Camphire of *Japan*; the Oyl is of the ſame Virtue; anointed upon Scabs, Itch and Excoriations, it cures them in a ſhort time. To drink the Water among common Waters cures Fluxes, and does good to thoſe who are under that languiſhing Diſeaſe, called by the *Hollanders* the *Lands Diſeaſe*, and by the *Ceilaneſe*, *Pipa*; of which we ſhall make mention at large in its proper Place. I never did ſee the Natives make uſe of Cinnamon, although they have ſcarcely a Meal without Pepper: neither is it uſed by the *Europeans* either in Meat, or diſtilled among the Rack, or infuſed in Drink, for it is thought that it occaſions Shortneſs of Breath.

n. 282. *p* 1248. There is a great Quantity of a kind of white Coral upon the Shore betwixt *Gale* and *Mature*, and many other Coaſts in the *Indies*, of which the *Hollanders* cauſe Lime to be burnt for building of Houſes, and the Walls of the Fortifications. There are great Banks of the ſaid Coral, it is porous, neither ſo firm and ſmooth as the upright, which grows in little Branches, and when they are come to the full growth, there grows other betwixt theſe, and then upon theſe grow others, until it is become like a Rock for thickneſs; theſe Branches are not ſofter when they are young, than when they are ripe, yet I have obſerved a Slime upon them always when they are under Water, which I ſuppoſe is the Subſtance which petrifies. I have ſeen three Leagues from *Batavia* upon that Iſland, where the *Hollanders* turn up the Keel of the Ships to dreſs and mend them, Oyſters of a Foot Diameter, the Shell of one of theſe did grow until it was three Foot of Diameter broad, and a Foot thick, after the Fleſh was petrified; upon theſe Shells, lying only three or four Foot under Water, I alſo always did find a Slime. Upon the Coaſt betwixt *Gale* and *Gindere* lies always *Os Sepiæ*, and in the River at *Catoene* there are found Rubies, and if one is deſirous, and ſeek among the Sand in the Water, he will find above a Drop weight of Rubies in the ſpace of one Hour, but they are very ſmall, for twenty of them will ſcarcely weigh a Grain weight, ſo that it is not worth a Mans while. Upon the Sea-Coaſt upon the Sand do lie a kind of little Cockles of the Bigneſs of Crabs Eyes or *Oculi Cancrorum*, there is no Cavity within, if beat into Powder they have the ſame Effect as *Teſtaceous* Powders, and are uſed inſtead of *Oculi Cancrorum*.

There are ſeveral Trees, one of which will be above ſix Fathom high, whoſe Root (I may ſay), grows above ground, after the following manner: when the Twig is about one half Foot high above ground, there grows out of the middle of the Stem a little Knot which grows downward, making an Angle with the Stem of thirty Degrees or thereabout until it touch the Ground, then it fixes in the Ground, ſending forth ſmall Sprigs, which, before it touched the Ground, had neither Branch nor Leaves, but all over green even like a Shoot. While this Shoot grows and the Stem grows higher, it ſtill ſhoots forth other Shoots, which always come out of the middle of the Tree or Trunk; thus it continues ſhooting forth theſe Shoots, until the Tree be at his full Growth, and the higher the Trees grow, the Knots and the Shoots are the thicker and longer, ſo that one of the Shoots which grows laſt, will be a Foot thick of Diameter, and three Fathom long. Now the Flower which is called *Happumal* grows upon a Tree that grows after this manner, and grows only two Fathom high; if they be planted round about an Orchard they are an excellent Hedge, for the Leaves are thorny and full of Pricks; when the Flower decays it carries a Fruit like a Pine-Apple, but is for no uſe.

Sakradewendra commands and governs all the reſt of the Gods, and did hear formerly the Prayers that were offered up to him from diſtreſſed People here upon Earth, and did grant their Requeſt, but now the Golden Chair whereupon he uſed to ſit is gone, and the Prayers which are offered up to him now have no Effect, becauſe the Foot of that Chair was made of a kind of Wax, which would turn ſoft by the Prayers and Tears of the Supplicators, and would ſink downward, by which means the *Sakradewendra* would look down and take notice of the Prayer of the Supplicant and grant his Requeſt. This Chair being of fine Gold was diſtributed among the Poor, which is the Cauſe wherefore he does not now perceive or know when any Man makes Supplication to him, therefore there are but few People that have any Benefit of the Prayers and Tears which they offer to him. He can indeed look far when he turns his Eyes towards any Place, for his Forehead reſembles the Peacock's Tail, it is ſo full of Eyes, and ſo ſometimes it chances that he looks down and takes notice of Men, but this is but ſeldom; therefore there is a Neceſſity for one to pacify theſe wicked Spirits which trouble us here on Earth. I could never underſtand of them how long this *Dewendra* had been a God, or how long he would reign, for none trouble their Heads to regard him any more.

The *Budun* whereof the *Banapots*, (or their Bibles, if I may call them ſo) makes great mention, has had the Life of all the Species of living Creatures that are in the World, having been firſt an Inſect, after his Death his Soul was regenerated into a Mouſe, after that an Ox, then a Monkey, and ſo forth, then a Man: and by his good Life and Merits was ſtill born in a better Condition, until he is become the ſupreme of all the Gods. Of the *Buduns* there have been three, every one of theſe Reigns has been counted after this manner, there is a great Hill about half a Mile of perpendicular Height, and about ſix Miles in Circumference, from the Hill a certain Bird comes once in a thouſand Years, and takes one Grain to a certain Place, and continues every thouſand Years once, until he has removed that Hill to another Place.

Of the Cape *of* Good Hope, *by Mr.* Maxwell, *n.*310.*p.*2423.

XII. The *Cape of Good Hope*, which is Part of *Monomotapa*, and the Southernmoſt Part of *Africa*, lies in the Latitude of thirty four Degrees thirty Minutes South, and ſixteen Degrees fifteen Minutes Eaſt of *London*. It was firſt, that we know of, diſcovered by *Bartholomew Diaz*, *A.D.* 1493, under *John* II. King of *Portugal*. He gave it the Name of the *Cape of Tempeſts*, becauſe of the Storms he met with there, with which 'tis not ſtrange that it is ſometimes troubled; as likewiſe with a Sea that runs very high, and makes it ill riding at Anchor there when the Wind is at North-Weſt, ſeeing it is a Shread of Land ſtretch'd out into a vaſt Ocean on each ſide; but King *John* gave it the Name of *Bona Eſperança*, or of *Good Hope*, which it ſtill retains; becauſe that when that Cape was doubled, he had good Hopes of finding out a Way by Sea to the *Eaſt-Indies*, about which he was then very ſolicitous.

The *Hottentots*, Natives of this Place, are a Race of Men diſtinct both from *Negroes* and *European Whites*, for their Hair is woolly, ſhort and frizled, their Noſes flat, and their Lips thick, but their Skin is naturally as white as ours, as appear'd by a *Hottentot* Child brought up by the *Dutch* in their Fort here. Their Stature is univerſally of a middle Size; they are clean limb'd, well proportion'd, and very nimble. I never ſaw a fat Perſon among them. They beſmear their Faces and Bodies all over with Suet, or other oleaginous Stuff, which, together with expoſing their Bodies to a warm Sun, makes their Skin of a Tawny Colour, and cauſes them to ſtink ſo, that one may ſmell them at a conſiderable Diſtance to the Windward; they adorn their Hair, which is always clotted with Greaſe and Naſtineſs like the Thrums of a Mop, with Shells, Pieces of Copper, *&c.* Both Sexes are clad with the Skin commonly of a Sheep, but ſometimes of ſuch wild Beaſts as they happen to kill, the hairy ſide outward in Summer, and inward in Winter, off which I have ſeen them pick and eat the Lice in the Streets: The Women wear Skins cut in Thongs about their Legs, to the Length of a great many Yards; which when dry, with the inſide out, look ſo like Sheeps Guts, that moſt Strangers miſtake them for ſuch. The Men hang their Privities in a Bag, and the Women cover theirs with a Flap or Apron made of Skin. The Women wear a Cap of Skin juſt dried and ſtitch'd together, whereas the Men commonly go bareheaded; they go bare-footed, except that when they travel they wear a Piece of a Skin faſten'd about their Feet. Their Weapons are Javelins, with which they are dextrous at hitting the Mark, and Bows with poyſon'd Arrows, which kill, as I am inform'd, upon drawing Blood, but what they are envenom'd with I could not learn: their Houſes are Hemiſpherical, made of Mats, ſupported with Stakes, ſo low that a tall Man cannot ſtand upright in one of them; Theſe they remove upon Occaſion, as the ancient *Nomades* did their Tents.

By all that I have ſeen and heard of them and other Nations, they are the moſt lazy and ignorant Part of Mankind; by virtue of which two moſt excellent Qualifications, there are no manner of Arts practiſed among them, no Plowing or Sowing, no going to Sea in ſo much as a Boat, no uſe of Iron or Money, no Notion of God, Providence, or of a future State, no Tradition of Creation, or a Flood, no Prayers or Sacrifices, no Magical Rites; nor, in fine, any Notion of an Inviſible Being capable of doing them either good or harm, upon the ſtricteſt Enquiry that I could make of Men of Senſe that had liv'd ſome time upon the Place; ſo that I believe their Ignorance hardly can be parallel'd: The only thing that looks like the leaſt Knowledge of any thing of this kind among them (in as much as I could learn) is a Cuſtom they have in Moonſhiny Nights of Dancing in the Fields, of which, if you ask them the reaſon, all their Anſwer is, that it is a Cuſtom of the *Hottentots*, and was ſo of their Forefathers; and that is all they can tell of the Matter. Now whether it be that they rejoyce in its Light, which diſpels that Darkneſs of which they are then moſt ſenſible, or whether they think it a Rational Being endued with freedom of Will, becauſe of its various Change of Forms, or for what other reaſon I will not pretend to determine; however as to no other thing, ſo neither to this do they pray or ſacrifice: Nevertheleſs ſome Voyagers have upon this ground, how truly I will not ſay, confidently writ, that they worſhip'd the Moon; and upon Enquiry I could not find that they took ſo much, nor indeed any ſuch notice of the Sun or Stars; which former at leaſt one would think a People ſo groſly ignorant would pay ſome reſpect to, if they worſhip'd any God, that being the moſt glorious Object of their Senſes: and accordingly we find it affected all Heathen Nations, as well the more Barbarous as the moſt Polite; in which ſingle Object, if we may believe *Macrobius*, all their Worſhiping center'd. Their great Ignorance, I ſuppoſe, may be in part caus'd by *Africa*'s being peopled (as is probable) by that End of it which joins to *Aſia*; ſo that the more the Inhabitants ſpread themſelves toward the Southern Extream, the more they were cut off from converſing with the more civiliz'd Part of the World; it is probable, I think, that they were propagated to this Place by the Eaſtern Coaſt of *Africa*, the Weſtern being now, and always having been, as far as we know, inhabited by *Negroes*, from whom it is not very probable, that theſe of ſo different a Colour ſhould have ſprung.

All the Reſemblance they have of Government is, that in every Neighbourhood the Eldeſt is firſt in Order and Dignity; his Advice as to what concerns the whole being moſt follow'd, as having moſt Experience. The Ceremony of Marriage is perform'd among them by the eldeſt Perſon in the Companies, ſprinkling the Perſons to be Married with his Urine, upon which, and cutting out one of the Man's Teſticles, the Buſineſs is over; this ſeveral that lived in the Place affirm'd to me for a certain Truth. Being inquiſitive to know the Truth of this, I had the Curioſity to ſearch ſeveral of them, (who will readily ſuffer you for a double Stiver to do it) in two of which I could find but one Teſticle, they (I ſuppoſe) being Marry'd, as the reſt who had two were not; which however ſhews the Miſtake of *Nieuhoff* and others, who aſſert, That the *Hottentots* cut out one of the Teſticles of all their Male-Children aſſoon as they are born (according to *Nieuhoff*,) or at the Age of nine or ten Years (according to others) and that, forſooth, to make them the more ſwift and nimble. When a Woman bears Twins among them, ſhe expoſes one to Death by Hunger or Cold, and nurſes the other; the reaſon of which two laſt Cuſtoms is alledg'd by ſome, how truly I know not, to be the Fear they have of their Nation's growing too numerous: The Cuſtom of revenging, rather than puniſhing Adultery with Death, has prevail'd among them. I was inform'd there, that they abhorr'd *Polygamy*, tho' ſome Writers have aſſerted the contrary, but (perhaps) they are as well miſtaken in that, as in the Semicaſtration of their Males. When any Perſon grows decrepid with Age, their Children, or neareſt Relations, ſhut them up in their Houſes, and ſtarve 'em to Death: They bury their Dead with the Skins they wore when alive about them. Their Food is for the moſt part Roots, but chiefly one by the *Dutch* call'd *Ontee*, which is roundiſh, about the bigneſs of ones little Finger, and hot in the Mouth; their Drink is Milk and Water; when they kill a Sheep, or a Cow, they eat the Guts and Garbidge, either broil'd or quite raw; they are great Lovers of *Tobacco* and *Brandy*, to purchaſe which from the *Dutch*, is all the uſe they have of Money. They are not *Cannibals*.

There was a *Hottentot*, who had liv'd for ſome conſiderable time in *Holland* and the *Eaſt-Indies*, and had learned to ſpeak *Dutch* and *Portugueze* very well, whom, upon his return home, his Wife, Children, and Friends, could not endure, nor would they converſe with him, till upon reſuming his ancient Habit, Diet, and Cuſtoms, he had returned to their way of living. Notwithſtanding their great Ignorance, they diſtinguiſh ſeveral of the more remarkable Stars by Names of their own impoſing: Neverthleſs they have no diſtinction of Weeks, of Months, or of Years, any otherwiſe than by their *Rainy Seaſons* (of which afterward;) for if you ask a *Hottentot* how old he is, he anſwers, ſo many *Rains*. They watch the *Elephants* where they uſe to Water, whom they ſhoot in the Eye, where only they can wound 'em.

This Country produces Lyons, Tygers, Elephants, Rhinocerots, Elks, (whoſe Hoofs here are ſaid not to have that Virtue aſcrib'd to 'em in Northern Climates,) Leopards, Wild Aſſes, of which one ſort is finely ſtreak'd with White and dark Brown; ſeveral ſorts of beautiful Wild Goats, Jackals, Baboons, Monkies, Deer, large Cows, and large Sheep without *Horns*, with *Hair* like a Goat, inſtead of *Wool*, and with *large Tails*, but not (in as much as I have ſeen) ſo large as ſome report 'em, *viz.* of twenty five Pound weight, (the Fleſh however of both which is very good;) ſmall Horſes, *&c.* Oſtriches, Pellicans, Hawks, Magpies, Wild Peacocks, Cranes, Guiney Hens, Pengwins, Flamingo's, Rock-Ducks, Partridges, Pheaſants, Geeſe, common Hens, Turkeys, and Ducks, *&c.* Here are likewiſe Manatees or Sea Cows, they are low, very thick and ill ſhap'd, have very ſhort Feet, and yet are very ſwift, have no Hair but what grows about their Noſtrils, have large Teeth, but are no Enemy to Man; they are not eaſily wounded, live much in Rivers, and are very ſhy. Here are Serpents of various kinds, with which however they are not much infeſted. Their Soil produces moſt ſorts of Fruits and Plants that grow with us, as Grapes of ſeveral kinds, Apples, Quinces, Olives, Oranges, Apricots, Cherries, Aloes of a great many kinds, but none (that I ſaw) of the right ſort, ſuch as *Socotra* produces, Pompions in abundance, Cabbages, *&c.* Corn, as Wheat, Barley, *&c.* of *Dutch* Cultivation. Here are likewiſe Lizards, Salamanders and Porcupines. This place is fit to produce whatſoever is planted in it, the Soil and Climate conſpiring to its Advantage.

The *Dutch Eaſt India* Company are ſaid to have bought this Place of the Natives; if they did, they certainly had a good Bargain of it for a little Tobacco and Brandy: But the *Dutch*, who are no better than their Neighbours, are not ſo very ſcrupulous as to trouble themſelves much about buying, in ſuch caſes, what they can take by force. Here however they have ſettled for the Convenience of a Rendezvous for their homeward bound *Eaſt India* Fleet; and they have poſſeſſed themſelves of the Country ſixty Miles from the Place of their firſt Settlement: Beſide their principal Town in *Table Valley* (ſo call'd from a neighbouring Hill, call'd *The Table Land*, becauſe of its Figure, from whence alſo the adjoyning Bay is call'd *Table Bay)* where they have a Fort, an Hoſpital, a ſupplied Church with about three hundred Families; they have two other ſmall Towns in the Country, call'd *Dragenſtein* and *Stallambuſs*, inhabited for the moſt part by *French Proteſtants*, who make moſt of the Wine the Place produces, which is not inconſiderable, either for Quantity, Quality or Variety, reſembling *French* Claret, *Rheniſh*, *Burgundy*, &c. they are about one hundred and twenty Families, and have one Miniſter between both Villages, a *Dutchman* who ſpeaks *French*.

In this place are reckon'd about two thouſand Perſons fit to bear Arms, and about ſix hundred Soldiers; no Perſon that is not in their own Service, tho' a *Dutchman*, is admitted into their Fort. They have prohibited the *Engliſh* to ſet up among them, tho' they have ſerved the uſual time of five Years in their Service, which Liberty they deny not to thoſe of any other Nation; and this, I am inform'd, is their practice in all their *Eaſt India* Settlements: However when any *Engliſh* Ship happens to touch here diſabled in Maſts, Rigging, Anchors, *&c.* they ſupply 'em for their Money out of their Stores. Inſtead of Cuſtoms and Exciſe, they uſe Monopolies; for the Monopolies of Wine of the Growth of the Place this Year 1706, was paid 39000 Gilders, imported Brandy 3000, and ſo of the reſt. All the publick Payments they make, are either for the Watch, or for killing of Lyons, twenty Dollars Reward being given for killing a Lyon, and ten for a Tyger; the latter they Hunt, but the former they only dare attempt by Stratagem, whom they thus deſtroy: When a Lyon in the Night time gets among their Cattle, he commonly kills more than he eats at that time, whither he ſeldom fails to return the next Night to eat up the reſt; but before he comes, they take care to ſet Snares about the Prey with Muſquets ſo diſpos'd, that in coming at it, he muſt of neceſſity draw the Trickers, the Muzzles being ſo planted, as that they ſeldom miſs him; but if he be not kill'd out right, the poor Muſquets are ſure to feel his Fury, for he gnaws the Stocks, and imprints the marks of his Teeth in the very Iron; and tho' they are able to go away, there they are known to watch for two or three Days to ſee who comes to look after the Execution, whom they ſet upon if he not well aware.

A ſort of Pilgrims in the *Eaſt Indies*, whom they call *Fouquiers*, and who often have occaſion to travel thro' the Deſerts, have a ſtrange dexterity in killing theſe Wild Beaſts; for when he ſees one of them making towards them, he faces him, kneeling on one Knee, and holds towards him a ſhort Spear in his left Hand, upon which, the Beaſt making a Leap at him pitches and fixes his Body, and then he runs down his Throat a Ponyard which he carries in his Walking-Staff, and ſo kills him. The *Colcheſter*, an *Engliſh Eaſt India* Man, was at that time in *Rogues River* in *Bengal*; it was Night when ſeveral of the Ships Company happen'd to be aſhoar in a Tent they had pitch'd to be merry in. Mr. *Ravenſcraft* the Second-Mate had juſt put on a clean Shirt, he happen'd to be the fartheſt in the Company from the Door, with his Face oppoſite to it, when a Tyger ruſhed in among them, ſeiz'd and carried him off in ſpight of them without having ſo much as a ſqueak for his Life: I ſuppoſe the glaring of the White Shirt, affecting the Tyger the moſt ſenſibly of the Objects that were before him, made him fix upon him rather than the reſt; the next Day, upon ſearch, they found ſome Remnants of his Body in an adjacent Wood. When a Tyger leaps at a Man, if his firſt Aim be avoided, he never, as they ſay, makes a ſecond Attempt.

The Winds which blow at the *Cape of Good Hope*, are of that kind which are call'd *Monſoons*; for between the beginnings of *March* and *September*, (which is their Winter) the Wind blows for the moſt part between the North and the Weſt, during which time they have not much fair Weather, from which rainy Seaſon the *Hottentots* compute their Year; but during the other half Year, the Wind generally blows between the South and the Eaſt, accompanied with very fair Weather: There oftentimes come down from the Neighbouring Hills moſt ſudden and violent Guſts of Winds upon the Neighbouring Parts.

The Companies Garden, which is about nine hundred and ſeventy of my Paces long, and two hundred and thirty broad, is not now in that fine order it was in during this Governour's Father's Time, when it was divided into four parts, in each grew abundance of the more remarkable Vegetables belonging to its correſponding Quarter of the World; but tho' the Climate, Soil and Situation are very favourable, 'tis now much neglected both in reſpect of its Plants and Walks, neither of which are extraordinary.

I met here with one *Teunis Gerbrantzen*, Maſter of a *Dutch* Ship, who in the Year 1690, was at *Terra di Natal* on the Eaſtern Coaſt of *Africa*, in the Latitude of thirty Degrees South, diſtant from the *Cape of Good Hope* about eight hundred Miles, where he ſaid he bought the Place for the *Dutch Eaſt India Company*, for twenty thouſand Florins. Coaſting thence to the *Cape of Good Hope*, his Ship was caſt away, but they all got ſafe aſhoar, who, to the Number of eighteen, ſet out by

Land for the Cape diſtant about two hundred Miles, where only four of them arriv'd, all the reſt dying by the way, through extremity of Hunger, Thirſt or Heat, except two or three that were kill'd by the *Hottentots*; they met with no Wild Beaſts by the way, Elephants excepted, whom they ſaw in great Numbers. In Year 1705, *Gerbrantzen* went again to *Terra di Natal*, the late King's Son then reigning, to whom he ſpake of the former Agreement with his Father: *My Father*, anſwers he, *is dead, his Skins* (i. e. *Cloaths*) *are buried with him in the Floor of his Houſe, which is burn'd over him, and the place is fenced in, over which none muſt paſs; and as to what he agreed to, it was for himſelf, I have nothing to ſay to it.* So *Gerbrantzen* urg'd it no farther, having no Orders concerning it from the Company. At his laſt being there, he met with an *Engliſh* Man who was left there, *A. D.* 1698; he had two *Hottentot* Wives, and Children by 'em, but would not return with him to *Europe*, leſt his Wives and Children ſhould be ſlain in his Abſence.

Mr. *Kolbe*, who was ſent thither by a *Pruſſian* Lord, the Baron *Kroſick* told me, the common Salt there made uſe of by the *Dutch*, was left in hollow places of the Earth's Surface, after the Sun had evaporated the Rain Water; the matter of Fact ſeems to me hardly credible; but if it be ſo, I think it can proceed from no other Cauſe, but the Rains diſſolving a Salt contain'd in the Earth, which upon the Rains being evaporated, remains in the bottom; which is the more probable, becauſe that within five Leagues of the Fort is the Salt Bay, which has its Name from the vaſt Quantity of Salt digg'd near it.

Of the Diſcovery of the New Philippine *Iſlands. n.* 317. *p.* 189. *A Letter from* Manila, *by Father* Clain.

XIII. 1. In viſiting our religious Houſes, I travelled over the Country of the *Pintados*; which are large Iſlands ſeparated from one another by Arms of the Sea, whoſe Ebbing and Flowing renders their Navigation very difficult and dangerous. At the Town of *Guivam* in the Iſle of *Samal*, the laſt and moſt Southern Iſland of the Eaſtern *Pintados*, we found twenty nine *Palaos*, or Inhabitants of certain new-diſcover'd Iſlands. The Eaſterly Winds, that blow on theſe Seas from *December* to *May*, had driven them three hundred Leagues from their own Iſlands, to this Town of the Iſle of *Samal*, where they arriv'd in two ſmall Veſſels, call'd *Paraos*.

They imbarked, to the Number of thirty five Perſons, to paſs over to one of the Neighbouring Iſlands; when there aroſe a very ſtrong Wind, that forced them out into the main Sea, ſo that they could not gain the Iſland they deſign'd for, nor any of the neighbouring ones. After having made ſeveral Attempts to get aſhore on ſome Iſland within their knowledge, but in vain, they were driven before the Wind for ſeventy Days together, without being able to make any Land. At laſt, out of all hopes of returning to their own Country, and half dead for want of Water and Proviſions, they reſolved to give themſelves up to the Mercy of the Winds, and land at the firſt Iſland weſterly that they ſhould come to. They had no ſooner taken this Reſolution, but they found themſelves in ſight of the Town of *Guivam* in the Iſle of *Samal*. A *Guivamois* that was then on Shoar, perceiving them, and judging by the Make and Smallneſs of their Veſſels, that they were Strangers, and out of their Way, took a Piece of Cloath, and made them a Signal of entering the Road he directed, to avoid the Shoals and Banks of Sand, they would otherwiſe run upon. Theſe poor People were ſo frighted at the Sight of this Stranger, that they began to put out again to Sea; but notwithſtanding all their Endeavours, the Wind forced them back a ſecond time towards the Shoar. When they were near, the *Guivams* again made the Signal as before; but ſeeing they did not mind it, but would unavoidably be loſt, he threw himſelf into the Sea, and ſwam to one of their little Veſſels, on purpoſe to bring them ſafe into Shoar. He was no ſooner got to them, but the Women with their Children at their Backs, and all that were in the Veſſel, threw themſelves over-board and ſwam to the other: He, ſeeing himſelf alone in the Veſſel, reſolved to follow them, and getting aboard the ſecond, ſhew'd them how to avoid the Shoals, and brought them ſafe to Land. In the mean time they ſtood immovable, and reſign'd themſelves up intirely to the Conduct of this Stranger, as ſo many Priſoners.

They landed on St. *Innocent*'s Day, the 28th of *December* 1696. The Inhabitants of *Guivam*, running to the Shoar, received them very kindly, and brought them Wine and other Refreſhments. They eat Coco's very freely, which are the Fruit of the Palm-Trees of this Country: The Pulp of them is ſomewhat like that of Cheſnuts, except that it is more oily, and furniſhes them with a ſort of ſweet Water, very pleaſant to drink. They gave them Rice boiled in Water, which is eat here and all over *Aſia*, as Bread is in *Europe*. They looked on it with Surprize; and taking ſome Grains of it, threw it on the Ground, imagining it to be Worms. They rejoyce if one brings them great Roots, call'd *Palavan*, which they eat greedily. In the mean time they brought to them two Women, that had formerly been driven on Shoar on the Coaſt of *Guivam*; who knowing a little the Language of this Country, it was by their means they learnt what I ſhall hereafter relate. One of theſe Women found among thoſe Strangers, one of her Relations, who as ſoon as they knew one another, fell a weeping. The Father, who has on him the Care of this Town, having heard of the Arrival of theſe People, ſent for them to *Guivam*. As ſoon as they ſaw him, and what Reſpect was paid him, imagining that he was the King of the Country, and that their Lives were in his Hands, they threw themſelves on the Ground, to ask his Pardon, and beg their Lives. The Father moved with Pity to ſee them ſo diſconſolate, did all he could to comfort them; he careſſed their Children, three of which ſtill ſuck'd, and five others were ſomewhat older; and promiſed their Parents to give them all the Aſſiſtance in his Power.

The Inhabitants of *Guivam* ſtrove one with another, who ſhould entertain theſe Strangers at their Houſes, and furniſh them with Proviſions and Clothes, and whatſoever elſe ſhould be neceſſary; which the Father granted them, on Condition they did not ſeparate thoſe that were Married, or take leſs than two of them together, for fear any ſhould die of Grief if left alone. Of thirty five Perſons that imbarked, five died through want of Proviſions and other Hardſhips in ſo long a Voyage; and ſome time after their Arrival here, died another.

They relate that their Country conſiſts of two and thirty Iſlands; which cannot be far diſtant from the *Marianas*, as may be judged by the Make and Smallneſs of their Veſſels, and Form of their Sails, which are very like thoſe of the *Marianas*. It is likely theſe Iſlands may be eleven or twelve Degrees of Northern Latitude, more Southern than the *Marianas*, and under the ſame Degree of Longitude as *Guivam*; for ſailing directly from Eaſt to Weſt, they came aſhore at this Town. It is alſo probable, that it was one of theſe Iſlands that was diſcover'd ſome Years ago at a Diſtance, when a Ship belonging to the *Philippines*, leaving the common Road, which is from Eaſt to Weſt under the third Degree of Longitude, and running further to the South-Eaſt, firſt perceived it. Some call this Iſland *Carolina*, from *Charles* II. King of *Spain*; and others the Iſland of St. *Barnaby*, becauſe diſcovered on the Day that the Church celebrates the Feaſt of that Apoſtle. It was again ſeen laſt Year, by another Veſſel that a Storm had driven out of its Road, in going from hence to the *Marianas*. The Governor of the *Philippines* has often given Orders to a Veſſel, that goes almoſt yearly to the *Marianas*, to look for this and other Iſlands that they ſuſpected to be hereabouts; but theſe Orders were ineffectual, God preſerving to this time the Diſcovery of them, and (as we hope alſo) the intire Converſion of theſe People. Of theſe two and thirty Iſlands, there are three of them that are uninhabited, unleſs it be with Wild Fowls; but the others are very well peopled. If any one ask the Number of Inhabitants, they point to a Heap of Sand, to ſhew that their Number is infinite. The Names of theſe Iſlands are *Pais*, *Lamululutup*, *Saraon*, *Yaropie*, *Valayyay*, *Satavan*, *Cutac*, *Yfalcu*, *Piraulop*, *Ytai*, *Pic*, *Piga*, *Lamurrec*, *Puc*, *Falait*, *Caravaruvong*, *Ylatu*, *Lamuliur*, *Tavas*, *Saypen*, *Tacaulap*, *Rapiyang*, *Tavon*, *Mutacuſan*, *Piyla*, *Olatan*, *Palu*, *Cucumyat*, *Piyalacunung*. The three that have nothing on them but Wild Fowls, are *Piculat*, *Hulatan*, *Tagian*. *Lamurrec* is the moſt conſiderable of all theſe Iſlands: It is there that the King of the Country keeps his Court; the Governors of all the other Iſlands are ſubject to him. Among theſe Strangers there is one of theſe Governors, and his Wife, who is the King's Daughter. Though they go half naked, yet their Carriage, and a peculiar Air of Greatneſs, ſufficiently diſtinguiſhes them from the reſt. The Husband has his Body painted all over with certain Lines, in ſuch manner that they form ſeveral Figures: The reſt of the Men are alſo painted in like manner, more or leſs. The Women and Children are not painted at all. There are nineteen Men of them, and ten Women, of different Ages. The Make and Colour of their Face is much like that of the *Philippinois.* The Men have no other Clothes, than a ſort of Saſh, ſeveral times wrapt about their Body, that covers their Reins and Thighs. They wear upon their Shoulders above an Ell and half of coarſe Linen Cloth, like a Cowl, tied before, and hanging looſe behind. Both Men and Women are dreſſed much alike, except that the Women have a piece of Cloth ſomewhat longer, that hangs from their Waſte down to their Knees.

Their Language is different from that of the *Philippines* and *Marianas*: Their manner of pronouncing it comes neareſt that of the *Arabs*, as ſome who underſtand that Language have obſerved. The Woman, that ſeems the moſt conſiderable among them, has ſeveral Rings and Necklaces of Tortoiſe-ſhell, (call'd here *Carey)* and others made of a Subſtance yet unknown to us, much reſembling Ambergriſe, but not tranſparent. The manner of their living at Sea, which was for ſeventy Days together, continually driven by the Wind, was thus: They caſt out a ſort of Net, made of a great Number of little Twigs of Trees tied together, having a large Mouth for the Fiſh to enter in at, and ending in a Point to prevent their getting out again. The Fiſh they took after this manner was all the Nouriſhment they had, and Rain-water ſaved in Coco-ſhels, which is the Fruit of the Palm-tree (as obſerved before) of the Figure and Size of a Human Scull. They have no Cows in their Iſlands: As ſoon as they ſaw them, they ran away, as they did likewiſe at the Barking of a Dog, in one of the Miſſionaries Houſes. Neither have they Cats, Stags, Horſes, or in general any Quadruped. Nor any Fowls but Sea-Fowls; excepting Hens, which they breed up, but never eat their Eggs. Notwithſtanding this their want of every thing, they are very merry and contented with their Condition. Their Songs and Dances are exact and regular: When they ſing, it is all together, every one obſerving the ſame Humour and Geſtures, which makes it very agreeable. They are ſurprized at the Government, Politeneſs, and Manners of the *Europeans*, of whom they had not the leaſt Knowledge. They admire not only the Solemnities and Ceremonies of the Church in celebrating Divine Service, but alſo the Muſick, Inſtruments, Dances of the *Spaniards*, and their Arms; but Gunpowder is what raiſes in them the greateſt Admiration. They wonder at the Whiteneſs of the *Europeans*, in reſpect of whom they are perfectly Tawny, as well as the Inhabitants of this Country. It does not yet appear, that they have either any Knowledge of a Deity, or that they worſhip Idols. Their Life is perfectly Savage, taking care of nothing but Eating and Drinking, in which they obſerve no ſet time, but eat and drink at any time or place, when hungry or thirſty, or they can find any thing to ſatisfy themſelves; yet they eat but little at a time, and never enough to ſuffice for a whole Day. They ſhew a great Reſpect and Deference for their King, and Governors of their Towns, and obey them very preciſely. Their Civility and Reſpect conſiſts in taking hold of the

Hand

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Hand or Foot of the Perſon they honour, and rubbing gently his Face. They have among their Utenſils ſome Saws, not made of Iron, but of a large Shell, called here *Taclobo*, rubbed and ſharpen'd upon a certain kind of Stone. They were ſurpriz'd at a Merchant Ship that was building at *Guivam*, to ſee the Number of Carpenters Tools that were uſed about it: They viewed them all one after another, with a great deal of Admiration. They have no Metals in their Country. The Father Miſſionary made each of them a Preſent of a large Piece of Iron, which they received with as much Joy, as if it had been ſo much Gold; and are ſo afraid it ſhould be ſtolen from them, that they lay it under their Heads when they go to ſleep. They have no other Arms but Lances or Darts, made of Human Bones very well ſharpen'd and fix'd on. They are very peaceful of themſelves; but if any Quarrel happens among them, it is decided with ſome Blows on the Head with the Fiſt, which yet very rarely happen; for when they would come to a cloſe Fight, they ſeparate them, and they are ſoon reconciled again. They are not dull and heavy, but on the contrary, have a great deal of Livelineſs and Courage. They are not ſo luſty as the Inhabitants of the *Marianas*, but nevertheleſs are well proportioned, and of a Shape much like thoſe of the *Philippines*. Both Men and Women let their Hair grow long, and hang looſe on their Shoulders.

When they underſtood they were to be conducted to the Preſence of the Father Miſſionary, they painted their Bodies all over with a Yellow Colour, which is look'd upon by them as a great Beauty. They are ſo well ſatisfied with finding here Plenty of every thing that is neceſſary for Life, that they offer'd to return home, and bring with them their Countrymen to enter into a Commerce with theſe Iſlands: Which deſign our Governor liked very well, in hopes thereby to gain this Country to the King of *Spain*. The oldeſt of theſe Strangers was once before caſt on the Coaſt of *Caragan*, in one of our Iſlands; but finding there none but Infidels, that lived in the Mountains and Deſarts, he returned home again, without knowing any thing of the Plenty and Riches of theſe Iſlands. They are very expert at Diving; and they ſay, they lately, in Fiſhing, took two large Pearls in their Shells, but threw them into the Sea again, not knowing the Value of them.

From Fa. Le Gobien, *ibid. p.* 196.

2. Theſe Iſlands are ſituate between the *Molucca*'s, the old *Philippines*, and the *Marianas*. They are eighty ſeven in Number, and make one of the fineſt *Archipelago*'s in the Eaſt; being incloſed on the North and South between the Line and the Tropick of *Cancer*, and on the Eaſt and Weſt betweeen the *Marianas* and *Philippines*. The Map was not made by *Europeans*, for none have yet been upon theſe Iſlands, but by the Iſlanders themſelves, after this manner. Some of the moſt ſkilful of them ranged upon a Table as many little Stones as there are Iſlands belonging to their Country; and marked out, as well as they could, the Name of each, its Extent and Diſtance from the others: And this is the Map, thus traced out by the *Indians*, that is here ingraved. The Natives never offer any

Violence to one another: Murder and Homicide are unknown to them; and they have a Proverb among them, That *one Man never kills another.* It is probable theſe Iſlands may abound in Gold, Amber and Drugs; being ſituate nearly under the ſame Degree of Longitude as the *Molucco*'s, from whence we have Nutmegs, and other valuable Spices.

Tho' theſe People ſeem barbarous to us, yet they have among themſelves a ſort of Politeneſs and regular Government. Every Iſland obeys its Chief, who himſelf is ſubject to the King of the Country. This Prince holds his Court in the Iſland of *Falu*, called likewiſe *Lamuirec*; which multiplicity of Names ſeems to be the reaſon why we cannot find in this Map ſcarce any of the Names mentioned in Father *Clain*'s Letter; or perhaps, becauſe at firſt from the Natives Pronunciation of the Names of their Iſlands, they were written by the *Spaniards* after a different manner from what they are at preſent. Tho' theſe Iſlands were never heard of in *Europe*, 'till within theſe five or ſix Years, yet 'tis a long time ſince, from the high Mountains of *Samal*, they have diſcover'd thick Smoaks on that Coaſt; which commonly happens in Summer time, when theſe Iſlanders ſet fire to the Woods and Foreſts to clear up the Ground. Theſe Smoaks, which the Fiſhermen of *Mindanao* and other Iſlands, have alſo obſerved when far out at Sea, have made them conjecture, that there was Land Eaſt of the *Philippines*; but they never had any certain knowledge of it, till ſome time before the abovemention'd Arrival of theſe Iſlanders at *Samal:* Which happened thus,

The King's Brother of theſe new *Philippines*, in a Sea Voyage, was driven on the Coaſt of *Caragan*, in the great Iſland of *Mindanao.* The *Spaniſh* Fathers, who have a very fine Miſſion there, received this Prince with a great deal of Honour and Friendſhip, and inſtructed him in the *Chriſtian* Religion; which he was ſo well pleaſed with, that he never thought of returning again to his own Country. In the mean time the King, diſſatisfy'd at the Loſs of his Brother, fitted out a Fleet of an hundred ſmall Veſſels, which he ſent to every Iſland under his Dominion, to ſee if they could learn any News of him. One of theſe little Veſſels was forced by a Storm on the Coaſt of *Caragan*, at the ſame place as the King's Brother was before. Where landing, they immediately knew him, and with Tears told him the occaſion of their Journey, the Diſcontent of the King his Brother, and deſired him to return back with them. The Prince thanked them for the trouble they had been at, and deſired them to ſatisfy the King, that he was well and contented, but could not, by any means, be perſuaded to return home again.

Explanation of the Map. Plate 14.

The Figure in the midſt of every Iſland, ſhews how many Days Sail it is in Circumference.

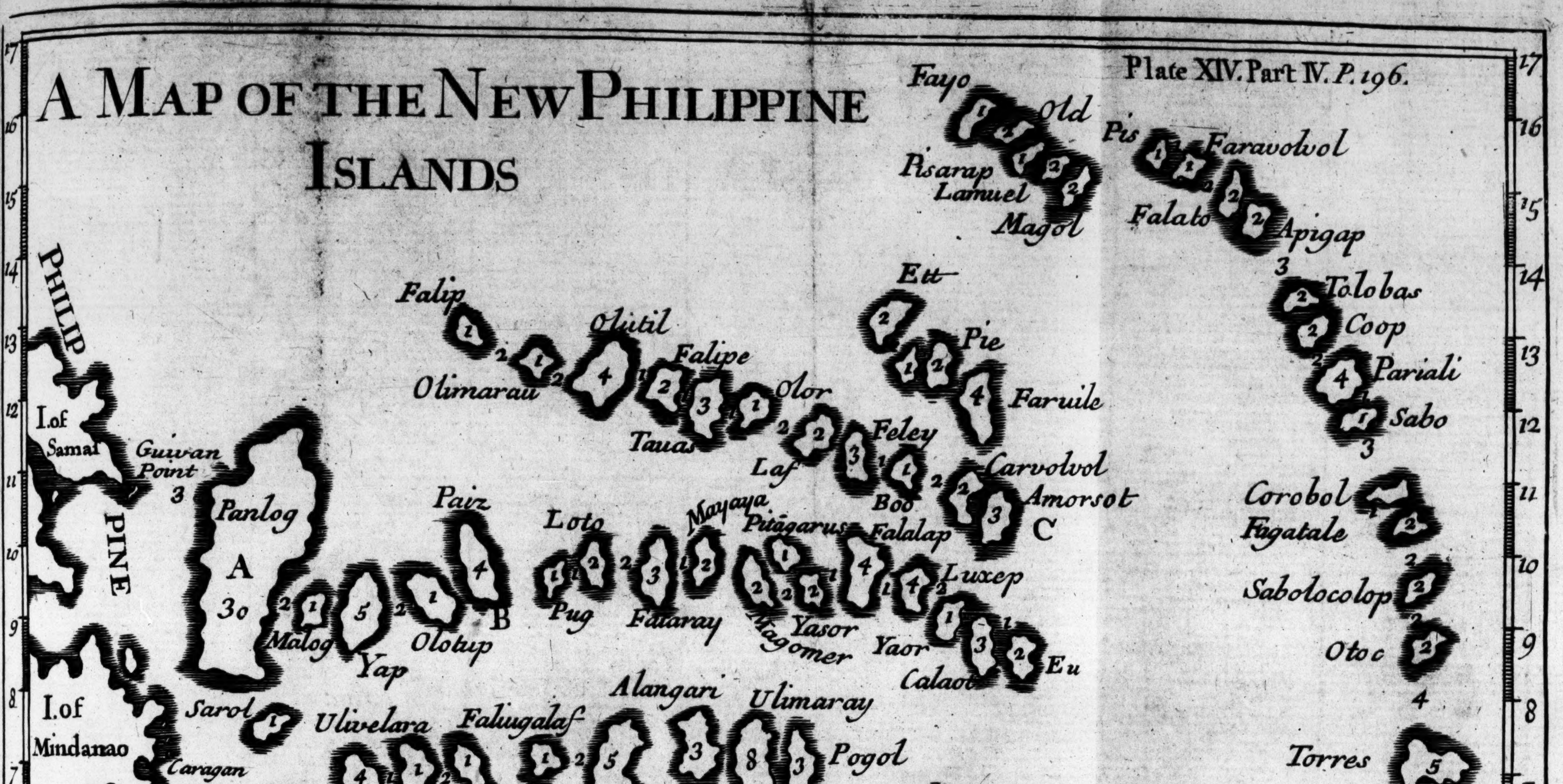
The Figure between each Iſland, ſhews how many Days are required to paſs from one to the other.

As

3

Plate XIV. Part IV. P. 196.

A MAP OF THE NEW PHILIPPINE ISLANDS


PHILIPPINE ISLANDS
I. of Samal
Guivan Point
I. of Mindanao
Caragan
C. S. Augustin
Saquil
MOLUCCO ISLANDS
Siao
los Meaos
Ternate
Tidore
Motir
I. of Gilolo
Panlog
A
30
Malog
Yap
Olotup
Paiz
B
Loto
Pug
Falaray
Mayaya
Pitagarus
Magomer
Yasor
Yaor
Luxep
Calaoc
Eu
Falalap
Boo
Carvolvol
Amorsot
C
Falip
Olimarau
Olutil
Falipe
Tauas
Olor
Laf
Feley
Ett
Pie
Faruile
Fayo
Old
Pisarap
Lamuel
Magol
Pis
Faravolvol
Falato
Apigap
Tolobas
Coop
Pariali
Sabo
Corobol
Fagatale
Sabolocolop
Otoc
Torres
Tata
Param
Tatam
Polie
Faor
Colapa
Pisumur
Pieras
Sarol
Ulivelara
Faliugalaf
Alangari
Ulimaray
Pogol
Muriel
Comul
Faliulapala
Falivelap
Pirigaraca
Losacay
Farale
Ontocoso
Piguela
Equinoctial Line
Faratay
Salva
May
Faramalo
Farali
Taramit
Falù ou Lamuirec
D
Farilies
Alingaray
Tacaylap
Marioc
Raor
Pariwu
Ulier
A: Iohnston Sculp:

As for Inſtance. Fig. 30, in the Iſle of *Panlog*, ſhews that it is thirty Days in Circumference; and the Fig. 3, between the Cape of *Guivam* and the Iſle of *Panlog*, ſhews, that it is three Days Paſſage to it.

The *Indians*, who were the occaſion of thoſe Iſlands being diſcovered, imbarked in the Iſland *Amorſot*, mark'd in the Map by the Letter C, with a deſign to paſs to the Iſle of *Paiz*, mark'd by the Letter B; but were driven by a Storm out to Sea, and after ſeventy Days Sail, caſt on the Cape of *Guivam* in the Iſland of *Samal*, called by the *Spaniards*, *Ibabao*.

A, The largeſt of theſe Iſlands, named *Panlog*.

D, The Iſle of *Falu*, or *Lamuirec*, where the King holds his Court.

Obſervations on the Mechanick Arts and Phyſick of the Eaſt-Indians, *in a Letter from* Bengale *n.* 337. *p.* 225

XV. This Country furniſhes Materials for mechanic Arts and Sciences more than any Country that I know of. The Artiſans here have wonderful Skill and Dexterity: They excel particularly in making Linen Cloth; which is of ſuch fineneſs, that very long and broad Pieces of it may eaſily be drawn thro' a ſmall Ring. If you tear a piece of Muſlin into two pieces, and give it to one of their Fine-Drawers to ſet it together again, it will be impoſſible for you to diſcover where it is joyned, tho' you mark it on purpoſe to know it. They will place together ſo artificially the Pieces of Glaſs or *China* Ware, that one cannot perceive it was ever broken.

Their Embroiderers work in Filigreen very curiouſly: They imitate exactly any Work made in *Europe*, tho' the Engine they make uſe of, and all their other Utenſils, do not coſt them above the value of a Crown. The Looms that their Weavers uſe do not coſt them more: With theſe they ſit in their Courts and Yards, or on the ſide of the Highway, and work thoſe fine Stuffs, that are ſo highly eſteem'd over all the World. They have here no need of Wine to make *Aqua Vitæ*; but make it of a Syrup, Sugar, ſome certain ſorts of Barks and Raiſons; it burns better, and is ſtronger than that made in *Europe*. They paint Flowers, and gild very fine upon Glaſs. I was ſurpriz'd to ſee their Veſſels, which they uſe to cool Water in, and are not thicker than two Leaves of Paper paſted together. Their Watermen row after a different manner from ours. They move the Oar with their Feet, and their Hands ſerve inſtead of the *Hypomochlion*, or Roller on which it turns. The Liquor which the Painters uſe, does not any way loſe its colour, nor is it tarniſh'd by Lye. The Husbandmen in *Europe* prick their Oxen with a Goad to make 'em go faſter; but here they only twiſt or wring their Tails. Theſe Beaſts are very docile: They teach them to lye down, or riſe up when they take up or lay down their Burthen. They make uſe of a kind of Hand Mill to break their Sugar-canes, which does not coſt them above the value of ten Pence. The Perſon, that grinds, works and faſhions the Stone himſelf with Lac and Emery.

Their Maſons will pave the largeſt Room with a ſort of Cement made of Brick Duſt and Lime, ſo that it ſhall ſeem to be but one Stone, and is much harder than Gravel. I ſaw them make a ſort of Pent-houſe, that was forty Foot long, eight Foot broad, and five or ſix Inches thick; which they raiſed up in my Preſence, and fixed it to the Wall on one ſide only, without putting any Prop under it to ſupport it. Their Pilots take the Altitude (or Latitude of Places) with a Cord that has ſeveral Knots in it. They put one end of the Cord between their Teeth, and by means of a piece of Wood fixed to it, that has a Hole through it, they eaſily obſerve the Tail of *Urſa minor*, which is commonly called the Polar Star, or North Pole. Their Lime is uſually made of Sea Shells: That which is made of Snail Shells ſerves to whiten their Houſes; and that which is made of Stones they chaw with the Leaves of *Betel*. I have ſeen ſome of them that would take as much of it in a Day as the quantity of an Egg. They make their Butter in the firſt Pot that comes to hand: They cleave a Stick into four Quarters at one end, and ſtretching them out a ſunder in proportion to the ſize of the Pot that contains the Milk, they turn the Stick round different ways (backwards and forwards) by means of a Cord twiſted about it; and by this means in a ſhort time make the Butter. Thoſe that ſell Butter have the Art of making it paſs for freſh, when it is old and rank. To do this, they melt it, and pour upon it ſowr curdly Milk; and in eight Hours after they take it out in Lumps and ſtrain it thro' a Cloath for ſale.

Their Chymiſts make uſe of the firſt Pot they meet with to revive Cinabar and other Preparations of Mercury, which they do after a very ſimple manner. They eaſily reduce all Metals into a Powder; as I my ſelf can witneſs. They ſet a great value upon Talk and Braſs, which conſume, as they ſay, all viſcous Humours, and remove the moſt ſtubborn Obſtructions. Their Phyſicians are more cautious in uſing Sulphur than they are in *Europe:* They correct it with Butter; and put Broth upon it made with long Pepper, in which are boiled the Kernels of the *Indian* Pine-Apple. Wolfs-bane corrected in Cows Urine, and Arſenick corrected with the Juice of Lemons, they uſe with ſucceſs in Fevers. A Phyſician is not permitted to take care of a ſick Perſon, unleſs he can gueſs at his Diſeaſe, and what Humour is moſt predominant; which they eaſily know by feeling the Pulſe of the Patient; nor are they often deceived. The principal Diſeaſes that reign in this Country, are, 1. The *Mordechin*, or *Colera morbus:* The means by which they cure it, is by not ſuffering the Patient to drink, and by burning the Soals of his Feet. 2. The *Sonipat*, or Lethargy; which is cured by putting into the Perſon's Eyes bruiſed Pepper mixed with Vinegar. 3. The *Pilhai*, or Obſtruction of the Spleen; for which they have no Specific Remedy, unleſs it be that of the *Joghis*, (or converted *Indians*:) They make a ſmall Inciſion under the Spleen, and put in between the Skin and Fleſh a long Needle; from whence by ſucking with the end of a Horn, they draw out of the Orifice a kind of a fat Matter that reſembles *Pus* or Corruption. Moſt of the Phyſicians have a Cuſtom of putting a drop of Oil on the Urine of the ſick Perſon: If it ſpreads abroad, they ſay it is a ſign that the Patient is very hot within; but on the contrary, if it keeps together intire, it is a ſign that he wants Heat.

The common People uſe very ſimple Medicines. For the Megrim they ſmoak, like Tobacco, the dry'd Bark of a Pomgranate Tree reduced to a Powder, and mix'd with four Corns of Pepper. For the common Head-ach, they ſmell to a *Nodule*, compos'd of a Mixture of *Sal-Armoniac*, Lime, and Water, ty'd up together in a Linen Rag. Such Dizzineſſes of the Head, as proceed from a cold thick Blood, they cure by drinking Wine, in which are ſteep'd a few Grains of Frankincenſe. For Deafneſs, occaſioned by too great a quantity of cold Humours, they drop into the Ear a drop of Juice of Lemon. When the Brain is charged and oppreſſed with watry Humours, they ſmell to black Cummin-ſeed bruiſed and tied up in a Nodule. For the Tooth-ach, they put upon the Tooth affected a Paſte made of Crums of Bread, and the Seed of the *Stramonium*, which ſtupifies the Part affected, and eaſes the Pain. In an Hæmorrhage, or Flux of Blood, they make the Perſon ſmell to bruiſed Mother-wort, or Wormwood. For a too great heat of the Breaſt, and ſpitting of Blood, they cover with Paſte a *Giraumont*, (which is an *Indian* Fruit like a *Gourd*, and taſtes like a *Citrull*,) which they bake in an Oven, and drink the Water that comes from it. For the Cholick that proceeds either from Wind and watery Humours, they give to drink four Spoonfuls of Water, in which Aniſeeds and a little Pepper have been boiled to a Conſumption of half. They alſo bruiſe an Onion with Ginger, and apply it to that part of the Belly where there is moſt Pain. For the Lientery, they roaſt a Clove of Garlick under the Aſhes, and when they go to Bed they hold it in the Mouth and ſuck out the Juice of it. If they drink the Juice of the Leaves of Cucomber bruiſed, it Purges and Vomits them. They cure a Difficulty of Urine, by drinking a Spoonful of Oil of Olive well mixed together, with a like quantity of Water. For a Looſeneſs, they torrify a Spoonful of white Cummin-ſeed, and a little powdered Ginger, which they ſwallow mix'd with Sugar. I have ſeen them cure Fevers which begin with a ſhivering Fit, by giving the Patient three large Pills made of Ginger, black Cummin and long Pepper. For *Tertian* Agues, they give the Perſon for three Days together three Spoonfuls of the Juice of *Teucrium*, or great Germander, with a little Salt and Ginger.

XIV. 1. On the 12th of *May* 1707, there began to riſe up an Iſland a Musket-ſhot diſtant from the Iſland of *Sant-Erini*, which continually increaſing from Day to Day in the ſame manner, and troubling the Sea, there aroſe up ſeveral Rocks, that fixed themſelves to this Iſland; ſo that at this time it is about half a Mile in Circumference.

An Account of a New Iſland raiſ'd in the Archipelago, *communicated by* Dr. Sherard *to* Mr. Petiver. *n.* 314. *p.* 67.

Conſtan-

From the Paris Gazette, Ap. 14. 1708.

Plate 15.

2. *Conſtantinople*, *Jan.* 4. 1708, They write from the Iſland of *Sant-Erini* in the *Archipelago*, about twenty eight Leagues North of the Town of *Candia*, of the firſt of *December* laſt, that there was ſprung up an Iſland from the bottom of the Sea, which at that place is very deep, formed of Stones caſt up by a *Volcano* under-ground at the bottom of the Sea, which has often produced the ſame Effects, and after the ſame manner. In the Year 726, in the time of the Emperor *Leo Iſauricus*, there was found an Iſland on the North ſide, called the *Burnt Iſland*, by Matter vomitted up and heaped together by this *Volcano*. In the Year 1427, in the Month of *December*, this *Burnt Iſland* was increaſed by great Rocks caſt up by ſubterraneous Fires. In the Year 1650, in the Month of *September*, the *Volcano* again took Fire, and produced the ſame Effects, without forming any Iſland, but only a Shelf or Bank ten Fathom under Water in the Sea, where it has no Bottom. Laſtly, In the Month of *November* 1707, the *Volcano* made an Iſland, which is already two Miles in Circumference, and increaſes yet (this firſt of *December*) by Rocks and other new Matter that is thrown up. This Burning was preceded, as at all other times, by violent Shakings of the Earth, followed by a thick Smoak that roſe out of the Sea in the Day time, and Flames in the Night, and accompanied with a terrible roaring under Ground. There is no Example of the Effects of any *Volcano* at Land like theſe in the Sea; and yet what renders them the more credible, is, that the Iſland *Sant-Erini* it ſelf, is almoſt all of it compoſed of Burnt Rocks and Pumice-ſtones: It produces ſome ſorts of Grain, but has neither Rivers nor Springs, nor any other Water but what is ſaved in Ciſterns.

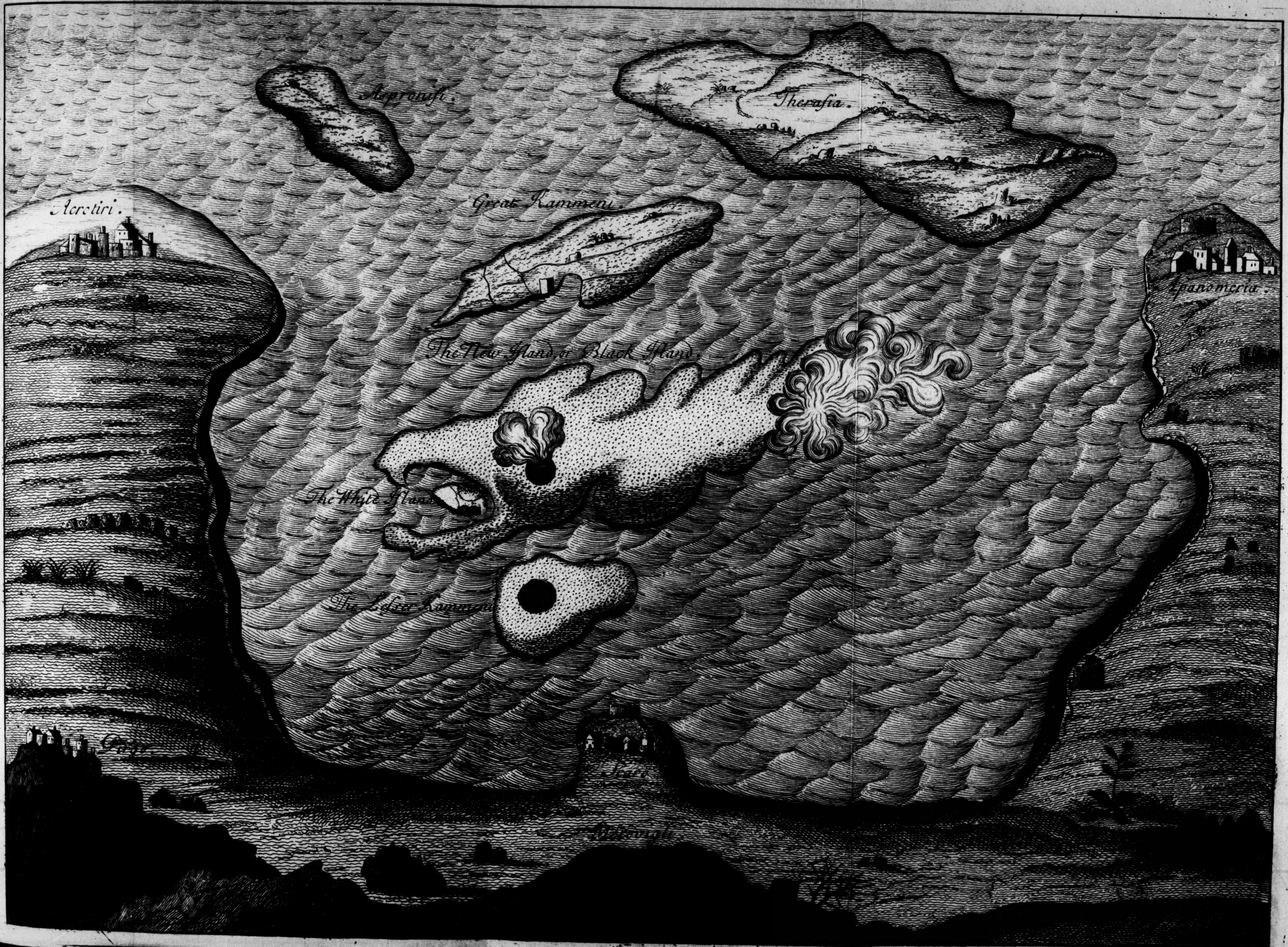
A farther Relation, by Father Goree, *an Eye-witneſs. n.* 332. *p.* 355.

3. This is not the firſt time that theſe Prodigies have been ſeen at *Santorini*: For, if it be not true, that this Iſland it ſelf, which was anciently call'd *Thera*, was in like manner raiſed out of the Sea (as *Pliny* aſſures us it was,) it is at leaſt moſt certain, that three other ſmall Iſlands (two of which lye within the Bay of *Santorini*, and the third a little without it) have been formed and raiſed up above the Sea by ſubterraneous Fires.

The firſt of theſe Iſlands, which was anciently call'd *Hiera*, becauſe it was (as is thought) dedicated to *Pluto*, is now named *Megali Kammeni*, that is to ſay, the Great *Burnt Iſland*. *Juſtin* (*l.* 30. *c.* 4.) ſpeaking of the firſt War of the *Romans* with the *Macedonians*, and of the two Months Truce with *Philip* King of *Macedon*, and Father of *Perſeus*, then demanded, and which he obtain'd, according to *Salianus*, the fourth Year of theone hundred and forty fifth Olympiad, and the one hundred and ninety ſixth Year before the Birth of our Lord, tells us, that this Iſland roſe up from the bottom of the Sea this very Year after an Earthquake.

It became half as big again, in the Year of our Lord 726, by the joyning of another Iſland to it; which, according to the Relation of *Theophanes* a *Greek* Author cited by *Baronius*, roſe alſo out of the Sea, and raiſed itſelf exactly to the ſame height as the Iſland *Hiera*, and united ſo well to it, that at this time there remains no other Mark of its joyning, than only

Plate XV. Part IV. P.200.


Aspronisi.
Therasia.
Acrotiri.
Great Kammeni
Epanomeria.
The New Island, or Black Island.
The White Island
The Lesser Kammeni
Scaro

M. V^r Gucht Sculp.

a Cleft or Fiſſure, which reaches from one End of the Iſland to the other, and in ſeveral Places is not half a Foot broad. The ſame thing happened a ſecond time in the Year 1457, as appears by a *Latin* Inſcription upon a Marble at *Santorini:* But with this Difference, that the ſubterraneous Fire, after having raiſed to the Height of five or ſix Foot above the Water, a vaſt Quantity of Rocks, which formed a Space about a Mile in Circumference, opened a Paſſage for the Sea-Water to enter, by which it was extinguiſh'd; and the middle of that Space remain'd ſo low, that the Sea flowing into it by a ſubterraneous Canal, made there a ſmall Lake, which continues to this Day.

As to the ſecond Iſland, which is a little without the Bay, and is call'd in *Greek Aſpronisi*, or the *White Iſland*, becauſe the Earth, with which it is covered, is white like Lime; *Pliny*, who lived in the time of the Emperor *Veſpaſian*, ſays, that it roſe out of the Sea, and appeared in his time.

The third Iſland, which is the leaſt, and is called by the *Greeks Mikri Kammeni*, or the *Leſſer Burnt Iſland*, was formed in the Year 1573, according to the Relation of ſeveral old People, who learned it of their Anceſtors: and it is between this little Iſland and the Great *Kammeni*, that on the 23^d of *May* (New Stile) in the Year 1707, at break of Day, the New Iſland, of which I am now going to ſpeak, was firſt diſcovered.

Five Days before it appeared, *viz.* on the 18th of *May*, between one and two of the Clock in the Afternoon, there was at *Santorini* an Earthquake, which was not violent, and continued but a Moment: And in the Night between the 22^d and 23^d, there was alſo another, which was yet leſs ſenſible than the former.

It is natural to imagine, that it was then the New Iſland firſt began to move and raiſe itſelf from the Bottom of the Sea: Yet, if we conſider, that theſe two Earthquakes were not violent, and laſted but a Moment; and that the Bottom of the Sea was in this Place from eighty to a hundred Fathom deep, it ſeems difficult to believe, that in five Days time, it could riſe to this Height. What inclines me to think the contrary, is, that the Height it is at preſent above the Surface of the Sea, and which it did not arrive to in leſs than three Years time, is much leſs than that from the Bottom of the Sea to the Surface of the Water, as I ſhall ſhew hereafter. Add to this, that a long time before theſe Earthquakes, the Fiſhermen perceived an ill Smell every time they paſſed by that Place; which ſhews that the Iſland had then begun to move: Notwithſtanding it is very certain, that there have not been any other Earthquakes at *Santorini*, than thoſe which, fourteen or fifteen Years ago, continued for ſeveral Days, and were violent. Howſoever it was, ſome Seamen diſcover'd this Iſland early in the Morning; went immediately to it; but as ſoon as they found that it was a New Iſland, they return'd back, and ſpread the Report over the whole Iſland; which was the more readily credited, becauſe ſeveral of the Inhabitants had themſelves ſeen what happen'd in the Year 1650.

There

There was then a New Iſland, like to the preſent, which, between the Iſlands of *Santorini*, *Nio*, and *Andro*, roſe up by means of ſubterraneous Fires, which cauſed ſeveral violent Earthquakes, accompanied with a roaring Noiſe under Ground, ſulphureous Exhalations, an inſupportable Stench, and a black Smoak, which roſe out of the Sea, with Flames to the Height of ten or twelve Cubits. The Sea was then ſo toſſed backwards and forwards by the terrible Shocks of the Earth, that it overflowed and deſtroyed thirty thouſand Perches of Land in *Santorini*; and the Air was ſo infected with Exhalations which came from the Fire, that twenty five Perſons, and a great many Beaſts, were ſtifled. At laſt, when this Iſland had not above eight or ten Fathom of Water to riſe, ſo as to appear above the Surface of the Sea, the Force of the ſubterraneous Fire was ſo violent, as to open a Paſſage before its time, by which the Water of the Sea entring like a Torrent, extinguiſhed the Fire, and this Maſs of Earth and Stones did not riſe any higher. Let us now return to our new Phænomenon.

Some of the Inhabitants of *Santorini* took a Reſolution to go and view the Situation of it: Which they did accordingly; and not imagining any Danger, went on Shore upon it. They paſſed from one Rock to another, upon which they met with ſeveral very remarkable Curioſities; among which we may reckon a ſort of white Stone, which cuts like Bread, and reſembles it ſo well in Form, Colour, and Conſiſtence, that were it not for its Taſte any one would take it for real Bread. But what pleaſed them more, was a great Number of freſh Oyſters which they found ſticking to the Rocks; which being very ſcarce in that Country, by reaſon of the Depth of the Sea, they got as many of them as they could. While they were buſy about this, they perceived the Iſland move and ſhake under their Feet. This was ſufficient to make them leave it immediately. In ſhort, the Riſing of the Iſland was viſible to the Eye, and it encreaſed not only in Height, but alſo in Length and Breadth. Though it was already between fifteen and twenty Foot high above the Sea, it could not yet be ſeen from the Mountain *Merovigli*, or the Caſtle of *Scaro*, which ſtands upon the Shore, by reaſon the Leſſer *Kammeni*, above mentioned, lay between, and hinder'd the Sight: But at fifteen Days end, they began to ſee it from *Merovigli*, and a few Days after, from the Caſtle of *Scaro*, ſituated upon another Mountain, which, though it be very high, in reſpect to the Sea, yet it is much lower than that of *Merovigli*, to which it joins. From whence we may judge how much this New Iſland grew in Height in a few Days.

As the Motion, by which this Iſland increaſed every Day in Height, was ſometimes equal, and at other times unequal, in reſpect to all the Parts of ſo great a Maſs; ſo did it not always riſe equally on every ſide. It often happened, that while it grew in Height and Length on one ſide, it ſunk down and decreaſed on the other. I one Day ſaw a Rock riſe out of the Sea, at forty or fifty Paces diſtant from the Iſland, which I continued to obſerve for four Days together; at the End of which time it ſunk again into the Sea, and did not appear any more: But this was different from what happened to ſome others; which having diſappeared, as this did, they re-appeared again ſome time after. The Leſſer *Kammeni*, which lies very near, was often ſhaken with the Motion which raiſed this New Iſland. From a ſmall Cleft, which we obſerved upon the Top of this little Iſland, ſometimes Stones would break looſe; which rolling down its Sides into the Sea, would raiſe as it were a Cloud of Duſt, which ſome People took to be Smoak, but in reality it was not ſo.

At this time, the Sea, which is contained within the Gulf or Bay of *Santorini*, ſeveral times changed its Colour: At firſt it appeared Green, afterwards Reddiſh, and ſometime after of a Yellowiſh Colour; with a Stink, which ſpreading itſelf over great Part of *Santorini*, made us imagine that this Colour proceeded from nothing elſe but the Sulphur with which the Sea was covered.

The Smoak appeared firſt upon the 16th of *July*: At which time, from a Place in the Sea, where (they aſſured me) they could never before find any Bottom, and which was above ſixty Paces diſtant from the New Iſland (which they then called the White Iſland) there roſe up a Ridge of black Stones, which the *Greeks*, by reaſon of their Hardneſs, call *Sideropetres*, or Iron-Stones, which formed another Iſland, named by the Inhabitants the Black Iſland; and which was afterwards not only the Center of the whole Iſland, but alſo of the Fire, and Smoak, and great Noiſe, that was heard ſome time after. The Smoak, which iſſued out of this Ridge of Stones, or Black Iſland, was very thick and white, as if it had proceeded from five or ſix Lime-Kilns joined together; and being carried by a North Wind towards the Caſtle of *Acrotiri*, it went into the Houſes of the Inhabitants, but without cauſing any great Annoyance, becauſe it had no very ill Smell. Four Days after the Smoak had thus appeared, they ſaw in the Night time Fire iſſuing out from the ſame Place, which however, was then but very little, being not above the Breadth of the Mouth of a Furnace, and did not appear in the Day time, but only in the Night, from Sun Setting to Sun Riſing; and was ſo far from ſpreading the whole Length of the Ridge of Stones above mention'd, that it poſſeſs'd but one ſmall Part of it, which was always afterwards the common Paſſage for the Smoak and Fire, which I ſhall ſpeak of hereafter.

As for the firſt Iſland, or White Iſland, we did not ſee there either Fire or Smoak; yet it continued to grow bigger; but the Black Iſland increaſed much faſter. We ſaw every Day great Rocks riſe up on every Side of it, which made it ſometimes longer, and at other times broader; and by the Height of them we could very nearly judge how many Foot it roſe up every Day or Night. Sometimes theſe Rocks joined to the Iſland, and at other times they were at a Diſtance from it; ſo that in leſs than a Month, there were four little Black Iſlands, which in a few Days after, united together, and made but one Iſland.

As the Smoak encreaſed very much, and there was no Wind ſtirring, it roſe up to the middle Region of the Air, ſo as to be ſeen (as ſeveral credible Perſons aſſured me) at *Candia*, *Naxos*, and other Iſlands; and in the Night time it appear'd of a Flame to fifteen or twenty Foot high. The Sea was at that time covered with a Matter or Froath, which in ſome Places was reddiſh, and in others yellowiſh; from whence there proceeded ſo great a Stench over the whole Iſland of *Santorini*, that for fear of being infected, ſeveral Perſons were obliged to burn Incenſe, and others to make Fires upon the Tops of their Houſes, to diſperſe it and to purify the Air. By good luck it did not continue above a Day and half; for a ſtrong South-Weſt Wind aroſe, which together with the Motion of the Sea, did indeed diſperſe this froathy Matter, but occaſioned otherways a great Damage to the beſt Part of the Iſland of *Santorini*. At that time they were in great Hopes of having ſhortly a very plentiful Vintage; when this Wind carried all the Smoak on upon their Vineyards, which burnt them up in ſuch a manner, that the Grapes (which were not yet ripe) turned in one Nights time like dried Raiſins, ſo that they were forced afterwards to throw them away, becauſe of their Sowerneſs.

It is farther remarkable, that Silver and Copper were changed black by it: And tho' ſome People, who were forced to paſs through the Smoak in going to their Houſes, aſſured me that it had no very ill Smell with it; yet ſeveral of them were, that and the next Day after, troubled with great Pains of their Head. At this time the White Iſland, which (as I have ſaid before) ſeemed to be above the Leſſer *Kammeni*, and could be ſeen from the firſt Floor of their Houſes in the Caſtle of *Scaro*, ſunk down ſo low, that it could not be ſeen from the ſecond.

Hitherto the Sea had not been obſerved to boil up, or any Noiſe heard upon the Black Iſland: But upon the 31^ſt of *July*, the Sea was ſeen to emit Smoak at two ſeveral Places; one of which was about thirty, and the other above ſixty Paces diſtant from the Iſland. In theſe two places, both of which were perfectly round, the Water of the Sea looked like Oyl, and ſeemed to riſe up and bubble: Which it continued to do for more than for a Month; in which time there were a great many Fiſhes found dead on the Shore, occaſioned by their happening to have been too near theſe two places.

The Night following there was heard a dull hollow Noiſe, much like that of ſeveral Cannons ſhot off at a diſtance: And at the ſame time there was ſeen to riſe out of the midſt of the Funnel Flames of Fire, which darted very high into the Air, and diſappeared immediately. Next Day there was heard ſeveral Returns of the ſame Noiſe, which was followed by a Smoak, not white, as uſual, but blackiſh; and which, notwithſtanding a very freſh North Wind, roſe up in a Moment a prodigious Height, in form of a Column, and in the Night time would, in all probability, have appear'd, as if it were all on Fire.

Auguſt the 7th, the Noiſe alter'd; and from being dull, as before, it became very loud, and reſembled the Noiſe which is made when ſeveral great Stones are thrown all together into a very deep Well: And I really believe that this great Noiſe was occaſioned by ſeveral large pieces of Rocks, which after having been raiſed up with the Iſland by the Violence of the Fire, broke of by reaſon of their weight, and fell back again into the Subterranean Caverns. What confirms me in this thought is, that I ſaw then the ends of this Iſland in ſo great a Motion, that after having appear'd for ſome Days, they then diſappear'd, and afterwards re-appear'd again anew. Howſoever it was, this Noiſe after having continued ſo for near a Month, was followed by another much louder and more extraordinary: It ſo nearly reſembled Thunder, that when it did really thunder, as it happen'd to do three or four times, there was very little difference between the one and the other. As the Paſſage, which the Fire had made it ſelf by its Violence through ſo many Rocks, was not, in all probability, in a ſtreight Line, and was in ſome places narrower, and in others larger and more free; ſo it is probable, that the Fire, or rather the Sulphureous and burning Exhalations, cauſed this great Noiſe, by turning from ſide to ſide in theſe winding Caverns, and endeavouring to get a Paſſage out, which was difficult for them to find: Which was the cauſe that the Noiſe of this Subterraneous Thunder was ſometimes not ſo loud, and a little while after grew more violent, and ſometimes was ſo ſtunning, that People talking together could ſcarce hear one another ſpeak; and that the black Iſland, which was already very high, ſeemed to crack on every ſide; and in ſhort, that the incloſed Fire, after ſeveral Windings and Turnings, having collected a ſufficient force, was able to break out with a Noiſe equal to that of ſeveral Cannons diſcharged at once.

Auguſt 21. the Smoak diminiſh'd conſiderably, as alſo the Fire: There did not appear any in the Night; but the next Day both returned with greater Force than at any time before. The Smoak was reddiſh and very thick, and the Fire ſo great, that the Water of the Sea ſmoak'd and bubbled up all round the black Iſland. I had in the Night the Curioſity to view with the Teleſcope the great Fire that appeared upon the Mountain of this Iſland, and I number'd ſixty Openings or Funnels, which threw out all of them a very bright Fire, and were divided from one another by Rocks. In all Probability there were others, and perhaps as many, on the other ſide of the Mountain, which I could not ſee. Next Morning I obſerv'd that the Iſland had been very much raiſed in the Night; that a Range of Rocks about fifty Foot long was roſe out of the Water, which made the Iſland broader than it was before; and that the Sea was almoſt covered over with the reddiſh froathy Matter above-mentioned. This Matter, or Froath, appeared upon the Sea every time that the Iſland increaſed conſiderably; and occaſioned a Stink, much like that of the Sink of a Ship: Which we may imagine to ariſe from a ſlimy Earth mixed with Sulphur, which being raiſed up with the Rocks, and coming to be waſhed off by the Waves, was looſened and diluted by the Water, and ſo ſent up to the Surface the Salts with which it was loaded.

The Fire had hitherto appeared but only in one place, upon the Top of the black Iſland; but on the 5th of *September* it made it ſelf another Paſſage, and appeared at the End of that Iſland, on the ſide next *Teraſia*, which is another Iſland, which ſome Authors ſay was formerly joyned to that of *Santorini*, and was ſeparated from it by an Earthquake. The Fire did not continue at this End but a few Days, during which, it decreaſed at the place whence it uſed commonly to iſſue out. And here we were very agreeably ſurpriz'd, in ſeeing the Fire three ſeveral times dart out from this place without any Noiſe, and riſe up in the Air like a large Rocket. The following Days there was much the ſame Spectacle; for the Subterraneous Thunder, after having made a great Noiſe, broke out from time to time with a Clap as loud as that of a Cannon, and was accompanied with a very beautiful and large Fire, which ſhooting up in an inſtant to a great Height, fell again on the Iſland, and illuminated it almoſt all over. I cannot better repreſent the Figure that the Fire made in the Air, than by comparing it to a certain Artificial Firework I have ſeen in *France*, and is there called the *Gerbe:* But with this difference, that this Fire, of which I am ſpeaking, roſe much higher, and was much larger, but not ſo diſtinct as that of the *Gerbe*. Immediately after the Fire was darted out, as I have ſaid, in the manner of a Rocket, there appeared in the Air a Blaze, in the form of a long fiery Sword, which continued ſome time, without moving, over the Caſtle of *Scaro*, and afterwards diſappeared. At that time alſo, the white Iſland and the black Iſland, having increaſed in length, in proportion as they roſe in Height, united together; and the End of the black Iſland, towards the South-Eaſt, began not to increaſe any more, either in Height or Length, while the End toward the Weſt increaſed very ſenſibly to the Sight: Which makes me imagine, that the Mines of Sulphur being at this place, and the Fire not finding any Paſſage out here, had force to raiſe up this part and not the other; for in the middle of the Iſland it always found Openings to iſſue out at, together with the Smoak. It had then four Paſſages there, which were ſo near one another, that one could not well diſtinguiſh them aſunder, but by the Smoak: I do not mean that Smoak which commonly iſſued out and was continual, but that which roſe up at ſome certain times with a great force; for this Smoak came forth ſometimes from one Paſſage, and ſometimes from another, and oftentimes out of all four together; ſometimes with a great Noiſe, and at other times without any Noiſe at all, tho' then alſo it iſſued out with the ſame impetuoſity. Out of theſe Paſſages alſo there came a whiſtling Noiſe, like that of an Organ Pipe; which, by the variety of Sound it made, pleaſed the Inhabitants as often as the Subterraneous Thunder ceaſed.

One would think, that the Noiſe of this Thunder ſhould not then be ſo loud, by reaſon of the ſeveral Paſſages of which I have ſpoken; yet, notwithſtanding, it was not at any time ſo great and ſo frequent as it was then, and as it was above ſix Months after. It was then, as I ſaid, like the Report of a Cannon: And there did not paſs a Day or a Night, but we heard five or ſix, ſometimes ten or twelve of them; and at the ſame time ſeveral great burning Stones were thrown into the Air; ſome of which falling one Day upon the great *Kammeni*, ſet fire to ſome Thickets of Buſhes upon that little Iſland; and others being caſt a great way into the Sea, had certainly deſtroyed a ſmall Veſſel that paſſed by at above a Miles diſtance, if it had gone by never ſo little later. Theſe Claps were always attended with this Smoak I have mentioned, which was very different from that which iſſued out continually from the Gulf of Fire almoſt in the middle of the Iſland; for this was much thicker and blacker, and roſe in an inſtant much higher, and was not diſperſed 'till ſome time after, and then fell in Aſhes upon the Country, or into the Sea; ſome of which the Wind ſometimes carried as far as *Anacuphi*, an Iſland about twenty five Miles diſtant from the Bay of *Santorini*. Some Perſons had the Curioſity to gather ſome of theſe Aſhes (which were of a Colour between black and white) and put them into the Fire, imagining they would burn like Gun-powder, which they very much reſembled; but they produced no other effect, than only making a ſmall hiſſing Noiſe.

September the 18th, two Hours after Midnight, there was an Earthquake at *Santorini*; with which they were the more ſurprized, becauſe they leaſt ſuſpected it, the Subterraneous Fires having had ſo free a Paſſage for ſo long a time. It did not do any damage; and had no other effect than to enlarge very much the Iſland, and to remove for ſome Days the Fire and Smoak into other places, through new Paſſages which it made, and to increaſe very conſiderably both of 'em. And in truth, I never ſaw ſo much Fire, or heard ſuch terrible Claps, as after this Earthquake. By the Violence of theſe Claps, Houſes were ſhaken at above three Miles diſtance; and out of the midſt of a great Smoak, which roſe up and appeared like a Mountain, one might ſee and hear great pieces of Rocks fall down into the Sea and upon the Iſland, which were thrown out with the ſame Violence and Noiſe as a Bullet out of the Mouth of a Cannon. The leſſer *Kammeni* was ſeveral times quite covered over with great Stones cover'd with burning Sulphur; ſeveral of which rolling afterwards from the top of this little Iſland into the Sea, made a very bright Light and pleaſant appearance in the Night. I thought at firſt, that the Fire had paſſed under-ground from the New Iſland to this; becauſe they are not very far aſunder: But I ſoon found my miſtake, and that this Fire proceeded only from theſe Stones ſulphur'd over; for the Sulphur, which which they were cruſted over, being conſumed, they were all extinguiſh'd in half a quarter of an Hours time, except ſome few which remained a light above half an Hour. One Day, when the leſſer *Kammeni* was all on Fire, after one of theſe furious Claps, and the Air was ſo too, thro' the frequent Flaſhes of Fire that appeared in the Clouds, we ſaw, by a ſurprizing Accident, three Flaſhes come out of the places where the Fire was, which one could not diſtinguiſh from real Lightning, but that they were formed lower, and were at the two Ends of the Iſland. By the Violence of one of theſe Claps, part of the top of the New Iſland was carried off into the Sea, and ſeveral Stones were thrown to above two Miles diſtance: And, as if the Mine had been exhauſted by this great Clap, three or four Days paſſed without any Noiſe, and almoſt without any Fire or Smoak. They thought then, that they ſhould have ſeen an end of it: But the Fire kindled again, and the Iſland became more terrible than before. I was then at a Village ſix Miles diſtant; where we heard ſo diſtinctly (notwithſtanding it lay under a Mountain) the Blaſt of the Mine, that the Inhabitants were ſo frighted at ſuch an extraordinary Clap, that I was forced to put 'em in Heart. At my return to the Caſtle of *Scaro*, I found the People much more alarmed than they were in the Village; and was informed immediately, that the Caſtle had ſuffered ſo violent a Shake, that the Doors of the Houſes, and the Windows that were ſhut, were opened by the Force and Violence of the Clap.

February the 10th 1708, at half an Hour after Eight of the Clock in the Morning, there was another Earth-quake at *Santorini*; and ſome Perſons aſſured me, that there was another the Night before, but not ſo ſenſible as this. If we may judge by what is paſt, our *Volcano* is ſo far from drawing ſhortly to an End, that it gets new Force by other Veins of Sulphur, which take Fire at a great diſtance. We have Inſtances of this in the Fire and Flames which riſe ſo frequently into the Air, and fall again over the whole Iſland, making in the Night time as fine a Spectacle as was ever ſeen in Artificial Fire-Works. Beſides, this, ſeveral great Rocks, joyning to the Iſland, which before were even with the Water, have been raiſed much higher; and the Noiſe, Smoak, and Boyling of the Sea, increaſe ſo much, that though the Inhabitants of *Santorini* have been ſo long accuſtomed to ſee all theſe things, yet they could not help being more afraid than before. And certainly not without reaſon; for the ſubterraneous Noiſe was more violent than ever, and continued ſeveral Days together without any Intermiſſion; and in the Space of a Quarter of an Hour the Mine diſcharged itſelf five or ſix times; the Noiſe of which, with the great Quantity of Stones it threw into the Air, the Shocks it gave the Houſes, and the Fire which appeared in open Day (which was never ſeen before) very much ſurpaſſes all that I have before ſpoken of it.

The 15th of *April* was remarkable above all other Days, for the great Number and Violence of the Claps; by one of which near 100 great Stones were mounted up all at once into the Air, and fell again at above two Miles diſtance in the Sea. Though I was then about three Miles off from the New Iſland, I obſerv'd one of a ſurprizing Greatneſs, which did not riſe ſo high as the reſt, but was driven farther, in a ſtrait Line, like a Cannon Ball.

From the 15th of *April* to the 23d of *May*, which was a Year from the Birth of this New Iſland, what I have deſcribed above, continued the ſame; and I did not obſerve any thing more in particular, unleſs it were that the Iſland increaſed in Height and not in Length; and that one furious Clap beat down at once all the Top of it; which by means of the Aſhes and Stones of all Sizes that fell upon it Day and Night, was not only repaired, but made much higher than it was before. All Particulars began to abate afterwards: The Smoak decreaſed; the ſubterraneous Noiſe was not ſo violent; and the Claps, though they were very frequent, were not however ſo loud, by reaſon that the Funnels, which gave a Paſſage to the Fire and Smoak, were then much larger than they were before.

Seeing there was no Danger, I went in Company with *Francis Criſpo* the *Latin* Biſhop of *Santorini*; who, as well as myſelf, had not ſeen it before but at a Diſtance, and had the ſame Curioſity as my ſelf to view it and take all the Dimenſions of it. And as our Deſign was to go aſhore upon it, if poſſible, we went directly to it; to do which, we were obliged to paſs over a Place, where the Sea ſmoak'd very much, but did not bubble. We were no ſooner come to this Place, but we perceived a Heat ſtrike upon our Faces; which was nothing elſe but the Fumes of the Sulphur, in the midſt of which we were at that time. The Seamen bid us put our Hands into the Water; which we did, and found it ſo very hot, that having taken them out again immediately, the Biſhop bid them make what haſte they could away; ſaying pleaſantly, that *that Place was too hot to tarry there long.* What ſurpriz'd and griev'd me at the ſame time was, that we were then 500 Paces off from the New Iſland, and that I had no time to ſound the Depth of this Place. From hence we went directly over to that Part of the Iſland, where it had encreaſed in Length, and where there was more Danger; for ſeeing that the Smoak was very thick, which ſhewed that there was a great Fire all thereabout, we did not think it ſafe to go any nearer, and ſo ſatisfy'd our ſelves with viewing only the Space that was between this New Iſland and the Leſſer *Kammeni*; which I found to be broader than I imagined, and judged that a Galley might paſs through the narroweſt Place of it. After this, we went on Shore upon the Great *Kammeni*, that we might from thence view nearer, and without any Danger, the whole Burning Iſland, and eſpecially that Side of it which we could ſcarce ſee from the Caſtle of *Scaro*. From hence it was, that we judged this New Iſland to be about two hundred Foot in Height, five Miles in Circumference, and a Mile over at its broadeſt Part. As to the Form of it, it is oblong, and reſembles in ſome meaſure the Figure of a Dragon; as may be ſeen by the Deſign of it, which I took from this Place.

After having tarried ſome time upon the Great *Kammeni* (where we had the Pleaſure to ſee often, not far off, a great many Stones thrown violently out of the Gulf of Fire, and fall down again with a terrible Noiſe upon the Iſland) we took a Reſolution to coaſt it round, and to go to the other End of it, not doubting but that we might get on Shore there, becauſe that Part of the Iſland had not increaſed for ſeveral Months, and there did not appear any Fire or Smoak there. We were within a hundred Paces of it, when putting my Hand into the Water, I perceived that it was warm, and that the further we went the hotter it grew. At this Inſtant the Mine diſcharged it ſelf; and the Wind drove upon us the thick Smoak, which broke out with ſuch Violence every time the Mine took Fire: And a Shower of Aſhes, and little Stones, not larger than common Hail-Stones, falling upon us, we were forced againſt our Will to quit our Deſign of going on Shore upon the Iſland at this Place. This Shower of Stones and Aſhes being over, we retired a little by reaſon of the great Heat of the Water; and letting down our Plummet, we had at this Place ninety five Fathom of Water, without finding the Bottom, our Line not being long enough. Viewing afterwards the Space that was at this End between the Iſland and the Leſſer *Kammeni*, we found in ſeveral Places that it was narrower at this Side than at the other; and that if the New Iſland ſhould continue to grow bigger, ſeveral Rocks, which were already half above Water, and roſe up nearer to the Leſſer *Kammeni*, would in time ſhut up the Paſſage and joyn both the Iſlands together, ſo as to make a little Port between them, which would be very commodious for the Shipping of *Santorini*. In returning afterward to the Caſtle of *Scaro*, we paſſed by the little Port of the Leſſer *Kammeni*; and (by reaſon of its Nearneſs) could ſcarce believe what they told us, *viz.* That they could not hear there any of the Noiſe that this New Iſland made: Which we found to be true, and that the Height of this little Iſland was the Cauſe of it.

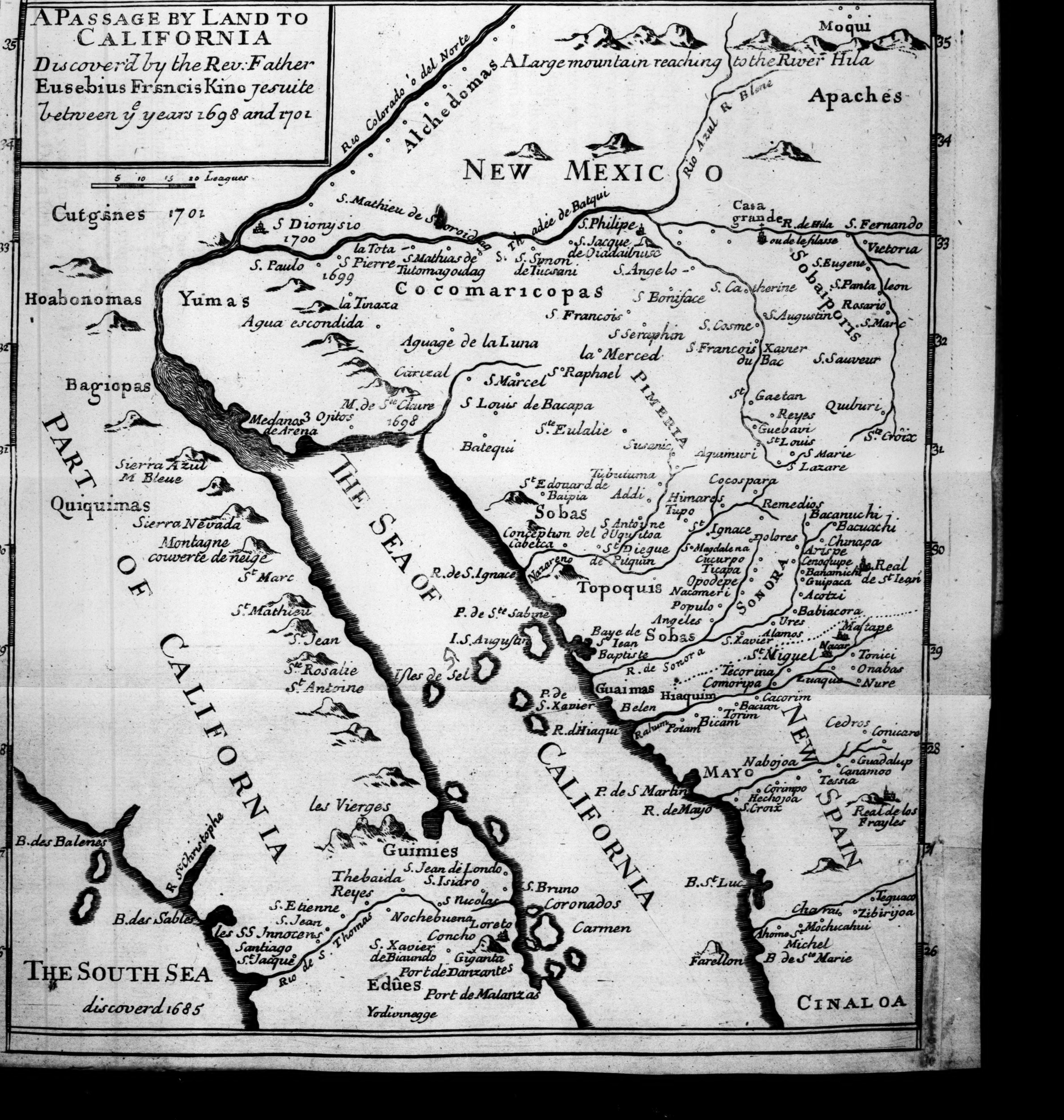
During all the reſt of the time that I tarried at *Santorini*, to the 15th of *Auguſt* 1708, (at which time I came away) the Smoak, Fire, and Noiſe, *&c.* continued much the ſame as I have now deſcribed them; that is to ſay, they were always pretty moderate.

This is all that I can ſay of this *Phænomenon*; all the Circumſtances of which I have related ſo much the more faithfully, becauſe I was the only Perſon at *Santorini* who kept a Journal of what happened every Day. From my leaving *Santorini*, to this preſent the 6th of *July* 1711, I have received ſeveral Letters, and have ſeen and ſpoken with ſeveral Perſons who have come from thence within theſe few Days, and they all tell me, that the New Iſland grows ſtill in Length on that Side next *Teraſia*: That it is now about ſix Miles in Compaſs: That as to the Fire and Noiſe under Ground, they were more moderate than before; which makes the Inhabitants of the Iſland hope, that they ſhall ſhortly ſee an End of it.

As for my Part, when I conſider, that the Paſſages which give Vent to the Fire, are very large, and almoſt in the middle of the Iſland; and that there is no Appearance that the Fire will ever make a Paſſage at the

Bottom

Plate XVI. Part IV. P. 211.



A PASSAGE BY LAND TO CALIFORNIA

Discover'd by the Rev: Father Eusebius Francis Kino Jesuite between ye years 1698 and 1701

5 10 15 20 Leagues
35
34
33
32
31
30
29
28
27
26
Rio Colorado ó del Norte
Alchedomas
A Large mountain reaching to the River Hila
Moqui
Apaches
Rio Azul
R. Blene
NEW MEXICO
Casa grande
R. de Hila
ou de le ʃlasse
S. Fernando
Victoria
S. Eugene
S. Panta leon
Rosario
S. Marc
Sobaiporis
S. Mathieu de Sorroida
S. Thadée de Batqui
S. Philipe
S. Jacque de Oiadaibuisc
S. Symon de Tucsani
S. Dionysio 1700
Cutganes 1701
la Tota
S. Mathias de Tutomagoidag
S. Paulo
S. Pierre 1699
Cocomaricopas
S. Angelo
S. Catherine
S. Augustin
Hoabonomas
Yumas
la Tinaxa
S. Boniface
S. Francois
Agua escondida
S. Cosme
S. Seraphin
Aguage de la Luna
la Merced
S. Francois Xavier du Bac
S. Sauveur
Carizal
S. Marcel
S. Raphael
PIMERIA
Bagiopas
St. Gaetan
Reyes
Quburi
Guebavi
St. Louis
M. de Ste Claire 1698
Medanas de Arena
3 Ojitos
S. Louis de Bacapa
Ste. Eulalie
Susanic
Aquimuri
S. Marie
S. Lazare
St. Croix
Batequi
PART OF CALIFORNIA
Sierra Azul
M Bleue
Tubutuma
St. Edouard de Baipia
Addi
Cocospara
Himares
Tupo
Remedios
Quiquimas
Sobas
Bacanuchi
Bacuachi
Chinapa
Sierra Nevada
S. Antoine
Conception del d'Uquitoa
Cabetca
St. Ignace
Dolores
Arispe
Cenoquipe
Banamichi
Guipaca
Real de St. Iean
Montagne couverte de neige
St. Diegue de Piquin
S. Magdalena
Cucurpo
Ticapa
Opodepe
Nacomeri
Populo
SONORA
Acotzi
Babiacora
St. Marc
R. de S. Ignace
Nazareno
Topoquis
THE SEA OF CALIFORNIA
St. Mathieu
P. de Ste Sabine
Angeles
Sobas
Ures
Alamos
Mastape
Nacar
I. S. Augustin
Baye de St. Iean Baptiste
S. Xavier
St. Niguel
Tonici
Onabas
Nure
S. Jean
Isles de Sel
R. de Sonora
Tecorina
Comoripa
Luaque
Ste. Rosalie
St. Antoine
Guaimas
Hiaquim
Cacorim
P. de S. Xavier
Belen
Bacuan
Torim
R. d'Hiaqui
Ratum
Potam
Bicam
Cedros
Conicaro
Nabojoa
MAYO
Guadalup
Canamoo
Tassia
NEW SPAIN
P. de S. Martin
R. de Mayo
Corimpo
Hechojoa
S. Croix
Real de los Frayles
les Vierges
B. des Balenes
R. St. Christophe
Guimies
S. Jean de Londo
S. Isidro
Thebaida
Reyes
S. Bruno
Coronados
B. St. Luc
S. Etienne
S. Jean
S. Nicolas
Nochebuena
Loreto
Carmen
B. des Sables
les SS. Innocens
Santiago
St. Jaque
Rio de S. Thomas
Concho
S. Xavier de Biaundo
Giganta
Port de Danzantes
Edûes
Port de Malanzas
Yodivinegge
Farellon
Charai
Ahome
St. Michel
Mochicahui
Teguaco
Zibirijoa
B. de Ste Marie
THE SOUTH SEA discoverd 1685
CINALOA

Bottom of the Sea, ſo as to let the Water in to extinguiſh it; I am of Opinion, that it may yet laſt longer than they imagine; and that this *Phænomenon* will not have an End, till the Mine of Sulphur is entirely conſum'd.

Of a Paſſage by Land to California, *n.*318. *p.* 232.

XV. We imbark'd in *October* 1697, and paſt the Sea that ſeparates *California* from New *Mexico*. As ſoon as we ſet Foot on Land, the People being ignorant of our Deſign, imagining we came to take from them their Pearl Fiſhery, as had been attempted ſeveral times before by others, came in great Multitudes againſt us, who had but an inconſiderable Number of *Spaniards* to defend us. The Violence with which they attack'd us, and Multitudes of Stones and Darts they threw at us, our Soldiers ſuſtain'd ſo vigorouſly, that they beat them back with Succeſs, and put them to Flight. Theſe *Indians*, after this Defeat, became more tractable; and ſeeing they could not gain any thing on us by Force, deputed ſome amongſt them to come and treat with us. We receiv'd them very friendly, and ſoon learned of them enough of their Language, to let them know the reaſon of our coming into their Country. Theſe Deputies undeceived the reſt; ſo that being ſatisfied of our good Intentions, they came to us in great Numbers, and ſhew'd a great deal of Joy to ſee that we were willing to inſtruct them in our Religion. This happy Diſpoſition incouraged us to ſtudy throughly the *Monqui* Language; in which, and inſtructing the People, we ſpent two Years. After this we thought of diſcovering other Nations; which that we might do more ſucceſsfully, the Father *de Salvatierra*, and my ſelf, reſolved to ſeparate, and take two different Ways: He went to the North, and I to the South and Weſt. By this means Father *de Salvatierra*, by little and little, diſcover'd all thoſe Habitations, that at preſent compoſe the Miſſions of *Loretto*, *Concho*, and St. *John* of *Londo*; and I, all that Country, at preſent call'd the Miſſion of St. *Francis Xavier* of *Biaundo*, which extends it ſelf to the South Sea.

Plate 16.

In proceeding each of us his Way, we obſerved ſeveral Nations of different Tongues mixt together: Some of them ſpoke the *Monqui*, which we underſtood; and others the *Laymon*, which we yet knew nothing of. This obliged us to learn the *Laymon*, which is of greater Extent than the *Monqui*, and ſeems to be Univerſal in this large Country. We apply'd our ſelves ſo cloſe to the Study of this ſecond Language, that we learn'd it in a little time, and began to preach indifferently in either.

California is pretty well placed in our common Maps. The Heats in Summer are very great along the Sea-Coaſts; and it ſeldom rains: But the Air of the Inland Countries is more temperate, and the Heat is not ſo exceſſive. It is the ſame in Winter proportionally. In the rainy Seaſon there are Floods; but when that is over, inſtead of Rain, the Dew falls in ſuch Plenty every Morning, that one would think it had rained; which renders the Earth very fruitful. In the Months of *April*, *May* and *June*, there falls with the Dew a ſort of *Manna*, which congeals and hardens upon the Leaves of Reeds, from whence they gather it: It is as ſweet as Sugar, though not altogether ſo white. The Climate muſt needs be healthy, if we may judge of it by our ſelves and thoſe that were with us: For during the five Years we were in this Kingdom, we continued very well in Health, notwithſtanding the great Fatigues we underwent: And of the other *Spaniards* there died but two; one of which was a Woman, who occaſion'd her own Death, by imprudently bathing her ſelf when ſhe was near Lying-in.

There are in *California* (as in the moſt beautiful Countries in the World) large Plains, pleaſant Vallies, excellent Paſtures, at all times, for great and ſmall Cattle; fine Springs of running Water, Brooks and Rivers, with their Banks cover'd with Willows, Reeds, and wild Vines. In their Rivers they have Plenty of Fiſh, eſpecially Cray-Fiſh, which they keep in a kind of Conſervatories, till they have occaſion for them: Three of theſe Conſervatories I have ſeen, that were very large and beautiful. There is alſo Plenty of *Xicames*, of a better Taſte than thoſe of *Mexico*. So that we may conclude *California* to be a very fruitful Country. On the Mountains there are all the Year long *Meſcales*, a Fruit peculiar to this Country; and in moſt Seaſons, large Piſtachio's of ſeveral ſorts, and Figs of different Colours. The Trees are very beautiful; and amongſt others, that which the *Chinos* (who are the Natives of the Country) call *Palo Santo*, bears a great deal of Fruit; from this they draw excellent Frankincenſe. This Country abounds alſo in Grain; of which there are fourteen ſorts that the People feed on. They uſe the Roots of Trees and Plants, and among others, thoſe of the *Yyuca*, to make their Bread of. There are excellent Skirrets; a ſort of red Strawberries, of which they eat plentifully; and Citrons and Water-Melons of an extraordinary ſize. The Land is ſo good, that moſt Plants bear Fruit three times a Year: So that with ſome Labour in cultivating it, and Skill in managing the Water, they render the Country extreamly fertile. Nor is there any ſort of Fruit or Grain, but what they gather in great Abundance; which we experienc'd our ſelves: For bringing with us from *New Spain* Corn, *Indian* Wheat, Peaſe, Lentils, *&c.* we ſowed them, and had a very plentiful Increaſe, though we had not any Cattle or proper Inſtruments to till the Ground.

Beſides ſeveral ſorts of Animals that we knew, which are here in plenty, and are good to eat, as Stags, Hares, Conies and the like; we found two ſorts of Deer, that we knew nothing of: We call them Sheep, becauſe they ſomewhat reſemble ours in make. The firſt ſort is as large as a Calf of one or two Years old: Its Head is much like that of a Stag; and its Horns, which are very large, like thoſe of a Ram: Its Tail and Hair are ſpeckled, and ſhorter than a Stags: But its Hoof is large, round, and cleft as an Oxes. I have eaten of theſe Beaſts; their Fleſh is very tender and delicious. The other ſort of Sheep, ſome of which are white, and others black, differ leſs from ours: They are larger, and have a great deal more Wool, which is very good, and eaſy to be Spun and Wrought. Beſides theſe Animals, that ſerve for Food, there are Lyons, wild Cats, and many others of the like, as in *New Spain.* We brought to *California* ſome Cows, and ſtore of ſmall Cattel, as Sheep and Goats; which would have increaſed very much, had not the Neceſſity we were once in obliged us to kill the greateſt part of them. We likewiſe brought with us Horſes and Colts to ſtock the Country, and began to breed up Hogs; but as theſe do a great deal of damage in the Villages, and the Women are afraid of them, we have reſolved to extirpate them.

As for Fowls, there are in *California* all that are in *Mexico*, and *New Spain*; as Pidgeons, Turtle-Doves, Larks, Partridges of an exquiſite Taſte and in great Quantities, Geeſe, Ducks, and many other ſorts both of River and Sea-Fowls. The Sea affords great Plenty of very good Fiſh: They take Pilchers, Anchovies, and Tunnys; which laſt they catch with their Hands on the Shore. We often ſee Whales, and all ſorts of Tortoiſes. The Shoars are fill'd with Heaps of Shells, larger than thoſe of Mother of Pearl. The Salt that they have, is not from the Sea, but out of Pits: It is as bright as Cryſtal, and ſo hard that they are often forced to break it with Hammers. It is a very good Commodity in *New Spain*, where Salt is ſcarce.

California has been known near theſe two Centuries; and its Coaſts are famous for the Pearl-Fiſhery, which has made the *Europeans* ſo deſirous of eſtabliſhing a Trade here. It is certain, if the King would erect a Fiſhery here at his own Charge, he might draw great advantage from it. Nor do I doubt but that there are Mines to be found in ſeveral places, if they were ſought for; ſince the Country is under the ſame Degree as the Provinces of *Cinalao* and *Sonora*, where there are very rich ones.

The *Californians* make no eſteem of the Plenty and Riches of their Country; contenting themſelves with what is only neceſſary for Life, they take little care for the reſt. The Inland Parts of the Country are very populous, eſpecially towards the North: And tho' there is ſcarce a Town, but what has twenty, thirty, forty, or fifty Families in it, yet they have no Houſes; but defend themſelves from the Heat of the Sun in the Day time under the Shade of the Trees and of their Leaves, and Branches, which make a ſort of Roof againſt the Inclemency of the Night. In the Winter they ſhut themſelves in Caves in the Earth, and live there together little better than like ſo many Beaſts.

The Men go naked; at leaſt all were ſo, that we ſaw. They wear about their Head, a fine Linen Fillet, or ſort of Network; and about their Neck, and ſometimes about their Arms, for Ornament, Mother of Pearl in divers Figures, very finely wrought, and prettily intermix'd with little round Fruits, ſomewhat like the Beads of a Chaplet. They have no other Arms than Bows and Arrows, and a ſort of Javelin, which they always carry in their Hand, either to kill their Game, or defend themſelves from their Enemies; for their Towns often make War upon one another.

The Women are ſomewhat more modeſtly cloathed, wearing from their Waſte down to their Knees a kind of Apron, made of Reeds very neatly wrought and matted together. They cover their Shoulders with the Skins of Beaſts, and wear about their Heads like the Men, a very curious kind of Net-work; which our Soldiers find ſo convenient, that they make uſe of them to tie up their Hair with. They, as well as the Men, have Necklaces of Mother of Pearl, mix'd with the Stones of ſome ſorts of Fruit and Sea-ſhells, hanging down to their Waſte; and Bracelets, in like manner of the ſame.

The common Imployment of both Men and Women, is Spinning. They make their Thread of long Plants, which ſerve them inſtead of Hemp and Flax; or elſe of a Cotton-like Subſtance found in the Shell of ſome ſorts of Fruit. Of the finer ſort of Thread, they make the Ornaments above-mentioned, and of the coarſer, Fiſhing-Nets, and Sacks or Bags for ſeveral Uſes. The Men moreover, (of certain Plants, whoſe Fibres are very cloſe and thick ſet, and which they are very well skill'd in working,) imploy themſelves in making Diſhes, and other Kitchen Neceſſaries of all Faſhions and Sizes. The ſmaller Pieces ſerve for drinking Cups; thoſe that are larger for Plates and Diſhes, and ſometimes for Umbella's for the Women; and the largeſt ſort for Baskets to gather Fruit in, and ſometimes for Pans and Baſons to dreſs their Meat in: But they take care to keep them continually moving, while they are over the Fire, for if the Flame catch them they are ſoon burnt.

The *Californians* have a great deal of Livelineſs, and are naturally addicted to Raillery; as we found when we began firſt to inſtruct them: For if we committed any Error in their Language, they jeſted and made Sport at us. But after we were grown better acquainted and more familiar with them, if we committed any Faults, they civilly adviſed us of them. And if at any time we explained any Myſtery, or Point of Morality, not conformable to their Prejudices and Errors, they waited for the Preacher after Sermon, and diſputed againſt him with a great deal of Force and Wit: If we could give them good Reaſons for it, they liſten'd very attentively; and when at laſt convinced, ſubmitted, and did accordingly. We have not found among them any Form of Government, Religion, or regular Worſhip. They adore the Moon, and cut their Hair, (as I remember) in her Decreaſe, in honour of their Deity; which they give to their Prieſts, who imploy it to ſeveral ſuperſtitious Uſes. Every Family makes Laws as they pleaſe, which is plainly the reaſon that they are ſo often at War with one another.

XVI. *Papers omitted.*

1. Animadverſiones quædam in Codicem MS. membranaceum in Bibliotheca D. *Laurentii Florentiæ:* excerptæ ex Additamentis G. *Ch. Schelhammeri* in *Herm. Coringii* Introductionem in Artem Medicam. cap. xii. p. 401. *n.*334.*p.* 459.

2. A Relation of the New Iſland thrown up near the Iſland of *Santorini*; ſent to the Marquis of *Ferriol*, Ambaſſador Extraordinary of *France*, at the *Ottoman* Port. Taken from the *Mem. Hiſt. Acad. Sc.* at *Trevoux* for *July*, 1708. Moſt of the material Particulars here mention'd being inſerted in Father *Goree*'s Account. *n.*317.*p.* 200.

XVII. *Accounts of Books omitted.*

1. A Voyage to the Iſlands of *Madera*, *Barbadoes*, *Nevis*, St. *Chriſtophers*, and *Jamaica:* with the Natural Hiſtory of *Jamaica*, by Sir *Hans Sloane*, Baronet. *n.*311.*p.*2433.

2. ’Ουρεσιφοίτης Helveticus: ſive Itinera Alpina tria, &c. Authore *Joh. Jac. Scheuchzero*, M. D. *Lond.* 1708. *n.* 316. *p.* 143.

3. *Archæologia Britannica*; giving ſome Account additional to what has hitherto been publiſh'd of the Languages, Hiſtories, and Cuſtoms of the original Inhabitants of *Great Britain*; From Collections and Obſervations in Travels thro' *Wales*, *Cornwall*, *Bas Bretagne*, *Ireland*, and *Scotland:* by *Edward Lhwyd*, M. A. of *Jeſus College*, and Keeper of the *Aſhmolean Muſæum* in *Oxford*, *Oxon.* 1707. *n.*311.*p.*2438.

CHAP. III.

Miſcellaneous Papers.

1. *One that could neither write nor read, yet caſt up Sums to great exactneſs, by Mr.* Locke, *n.*272. *p.* 893.

YEſterday I had at *Rotterdam*, a young Lad of ſeventeen Years old, that can neither write nor read, that out of his Head will reckon any the moſt difficult Sums you can give him, even to the utmoſt Fractions. I gave him an average to make of a Ship run aſhore; to ſave Ship and Goods were worth 13679,14. the Charges on the Salvage was 2931,16. I ask'd him how much that was *per Cent.* he told me, after a little talking to himſelf, that it was 21 gild. 9 ſt. and a ſmall Fraction, and ſo it is. I ask'd him what 4943,3, 2848,4, 2244,7, 2194,7, 544,19, 351,18, and 52,16 muſt pay reſpectively, he told me exactly to ſo many Stivers and $\frac{270}{1000}$. I ask'd him how he came by that Knowledge, he ſaid by ſelling Sea Snails (*Alykreucken*) and Muſcles, for he receiv'd nothing but doits, and ſo he brought his Father home ſo many doits, but could never tell how much Money they amounted to, till he ask'd his Father how many doits made a gilder, and being 160, then he reckon'd how many in 10 and 100, and ſo from one thing to another, he has a Table of Multiplication in his Head of half a Yard long or more: I try'd him by a Table I have, and he anſwer'd me as readily as you can upon the ordinary Table of Multiplication. He wanders from Town to Town to ſee who has any thing to Cypher, and ſo gets ſome Money; but would fain learn to read and write. This I mention becauſe it is ſo prodigious; and he divides almoſt with as much eaſe as he multiplies, and reduces things to the leaſt Denomination in Fractions. I have a great Mind, could I be aſſured of his Fidelity, to take him into my Houſe, and learn him to read, write and cypher.

Two Deaf Perſons, who can ſpeak and underſtand what is ſaid to them by the Motion of the Lips, by Rich. Waller, *Eſq; n.312.p.2468.*

II. There live now a Man and his Siſter, each about fifty Years old, neither of which have the leaſt Senſe of Hearing; they both live by their daily Labour, yet both theſe Perſons know by the Motion of the Lips only, whatever is ſaid to them, and will anſwer pertinently to the Queſtion propoſed to them of any thing within their Capacity, and are both very intelligent, as far as can be expected from their Education. I remember ſeveral Years ſince, when this Man was working in the Garden, Mr. *Colſon* and I ſtanding together, I took an Opportunity when the Fellow look'd on me, to ask him ſome Queſtion or other, which he readily underſtood, and anſwer'd according to it; tho' Mr. *Colſon* that ſtood by me heard me ſay nothing, the Fellow underſtanding it only by the Motion of the Mouth, ſo that you need only whiſper, provided the Lips and Mouth be but moved as they ought, and you do not ſpeak too faſt. I many Years ſince inquired of his Mother, who has been long dead, as to their Deafneſs; and ſhe told me, they could hear very well and ſpeak when they were Children, but both loſt that Senſe afterwards, which makes them retain their Speech: Tho' that, to Perſons not uſed to them is a little uncouth and odd, but intelligible enough, eſpecially the Man's. They were not Twins; and I knew two Brothers of the ſame Parents that had their Hearing as well as any Perſons whatever.

Of the Invention of Printing by ——— *n.288.p.1507. v. ſup. p.153.*

III. 1. That Books were printed at *Haerlem* by *Coſter* in 1430, and 1432 appearing from Copies of that * date there extant; and this agreeing ſo well with the Account given by *Theodore Schrevelius* and others, leaves us little or no room to doubt, whether the Honour of the Invention be due to *this* or the other Cities, whoſe Writers have ſo eagerly contended for it; ſince none of them have pretended to ſhew any Book printed near that time. But the Difficulty lies, either in ſhewing why the Practice of this Art ſhould be at a ſtand from *A. D.* 1432, to the noted Reviving of it at *Mentz*, by *John Fuſt* and *Peter Schoeffer*, who (as it has been vulgarly, but erroneouſly ſaid) did print the firſt printed Book there *A. D.* 1465, namely, *Tully's Offices:* or elſe, in giving any tolerable Account of the Progreſs of this Invention during an Interval of above thirty Years.

Boxhornius (as I remember) as well as *Schrevelius* and other Authors, do expreſly ſay, (and if they had not, it might well be imagin'd) that *Coſter* could not advance this Invention ſo far, as to print ſo large a Work as the *Speculum Salutis* without gradual Improvements; and that his firſt Eſſays were on looſe and ſmall *leaves* of Paper, before he attempted *whole Books*. Theſe being looſe and ſingle, are ſuppos'd to be all loſt: but I once obſerv'd a looſe leaf of Paper *in Octavo*, lying in an old MS. *Breviary* in her Majeſty's Royal Library at St. *James*'s, which I then thought (and am ſtill in the ſame Opinion) that 'twas one of *Coſter*'s firſt Pieces; done when he had attain'd to ſome Experience in the Art, and to get Money. 'Tis a little rude Wooden Cut, of the five Wounds of our Bleſſed Saviour, and the Inſtruments of his Paſſion, with a *Latin* Inſcription at the Bottom, to this Purport, that Thoſe who ſhould ſay ſo many *Ave Maria's* before it, ſhould have ſo many thouſand Years of Pardon. In this Cut or Print, the Ink which made it was *Writing Ink*, and 'twas all Black, without thoſe other Colours with which *Coſter* ſeems afterwards to have adorn'd his Books. * *Boxhornius* ſays that *Hadrianus Junius* had a Book Printed by *Coſter*, and like that kept in the Cheſt at *Haerlem:* Now amongſt thoſe bequeath'd to the *Bodleyan Library* at *Oxford*, by Mr. *Francis Junius* (who was a Kinſman of *Hadrian*'s) there is a thin Book in a ſmall Folio (Numbred 31.) which may probably be the ſame; and which Mr. *Foſs*, a learned and curious *Daniſh* Gentleman, did aſſure me was very like to that at *Haerlem*. This contains the Sum of the *Hiſtory of the Old Teſtament*, all repreſented in rude Wooden Cuts, coloured with divers Colours, without *Shadows* like to our *Cards*, (which, with *Sheet-Ballads*, are Remains of the old manner of Printing,) and Stamp'd upon one Side only; the white Sides of two Leaves being paſted together; the Black, both in the *Pictures* and *Inſcriptions*, which ſhew the meaning of them, being † *Writing Ink*, (as the aforeſaid Leaf) inartificially ſpread upon the Wooden Block; here thick, there thin; ſpreading and yellowiſh; the Letters extreamly rude, and all together manifeſtly ſhewing that the Art was yet in its Infancy. The Stamping of this Book on one Side only, was not (as ſome think) becauſe the *Printer* did not know how to diſpoſe the Pages in ſuch manner, as might be proper and eaſy for the *Book-Binder*'s Uſe; for it has its

* *De Origine* Artis Typographicæ.

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† Chap. II. p. 34 *It is to be wiſh'd that Mr.* * Ellis, *when he had* Coſter*'s Books in his Hands, had obſerv'd whether the* Black Ink, *was* Printing Ink *or not; whether* Coſter's Picture *was ancient and colour'd, or not; or if there were more in either of the Books; whether the whole was Cut upon Wood, or Compos'd with* Printing Letter; *whether there were* Signatures *for the* Book-Binders, &c.

* *v. ſupra p.* 153.

Signatures all along in *Minuſcule Letters*, (ſet in the Middle of the Page, which is remarkable;) but becauſe it was thought that the Paper would not bear a ſecond Impreſſion on the back Side; juſt as the *Book-Writers* of thoſe times (when Paper began to be cheap, and to be made up into Books) would yet have the firſt and laſt Leaf of each *Quaternio*, *Senio*, *&c.* to be of *Parchment* for Strength's ſake. This Book (as I remember) is imperfect, and has no *Date* now appearing, and perhaps never had any; neither has ſuch another Book as this, which contains the *Hiſtory of St. John and the Apocalypſe*, in ſuch like wooden coloured Pictures and Inſcriptions. This is inſcribed *L A U D. E. 65.* in the ſame *Bodleyan Library*, and has its *Signatures* alſo in *Majuſcule Letters* (as indeed I have obſerved *Signatures* in many MSS. of different Ages, as high as 1000 Years ago and upwards, expreſſed either by *Letters* or *Numbers*.) This Book, though Printed on one Side, and Paſted as the former, is yet more elegant, and ſhews that the Art was much improved. And here it may not be impertinent to obſerve, that in the ſame * Library is an ancient MSS. with the ſame *Figures* and *Inſcriptions*, though the *Habits* of the Figures be different, thoſe of the MS. being of the older Faſhion, and 'tis very likely that there is another Copy of this Book in the *Emperors* Library at *Vienna*; for † *Lambecius* reckons amongſt thoſe which he brought away from the *Archi-ducal* Library at *Inſpruck*, a Book of which he gives this Account, *Apocalypſis S. Joannis Apoſtoli & Evangeliſtæ Latino-Germanica, chartacea in folio, una cum Vita ipſius, & multis figuris ligno inciſis, quæ propter vetuſtatem ſuam ſpectatu ſunt digniſſimæ*, and in this Book at *Oxford*, beſides the Printed Cuts, alſo a *Commentary* upon the *Apocalypſe* in *High-Dutch*. Beſides theſe two moſt ancient Printed Books, Mr. *Bagford*, in the *Manuſcript Library* of *Corpus Chriſti College* in *Cambridge* ſaw a third, containing the *Hiſtory of our Saviour*, Printed on one Side only of the Paper, with ſuch like Wooden Cuts; but yet more neatly than either of the former, which I had before ſhewn him at *Oxford*. And theſe three Books, being as is before ſaid, Stamp'd but on *one ſide* of the Leaf; the whole *wrought* or *cut upon Wood*; not *Set* or *Compoſed* with *Printing Letter*; and Printed with *Writing Ink*; do ſufficiently demonſtrate that the Art was as yet in its Infancy; and may, though they bear no Workman's Name, be very reaſonably aſcribed to *Coſter*, not only becauſe no Body elſe lays claim to them, but becauſe in divers Circumſtances they agree with the Hiſtory of the Man, and with what remains of his Workmanſhip. If it be asked why *Coſter* did not ſet his Name, and the Year to theſe Books, as well as to that at *Harlem*, mentioned by Mr. *Ellis*? It may be anſwer'd, that *Schrevelius* tell us that *Coſter* bound *Fuſt* above-mentioned, by Oath to Secrecy, and not to betray the Art to any Perſon whatſoever. Wherein 'tis likely, that his Deſign was not ſo much to let the World think, that he had a new Way of multiplying the Copy of a Book much quicker than the quickeſt Penman; but that he deſigned to impoſe upon the World, by ſelling his *Printed Books*, for New-Written Copies, whereby the *Book-Writer* and

Illumi-

* *Arch.* B. Bodl. 88.

† *Comment. de Biblioth. Cæſ. lib.* II. p. 772.

Illuminator muſt (as he might well pretend) be ſo paid for their Work, as to maintain themſelves and Families. This Trick might be long undiſcovered in or about *Harlem*; becauſe there was no other Printing, whereby this might be condemn'd; but at length, as *Boxhornius* and *Schrevelius* write, *Fuſt* ran away with all his Maſter's Tools and Materials, and in Proceſs of time ſet up a Printer's Shop at *Mentz*, being aſſiſted by his Servant *Peter Schoeffer* (a Young Man of a good Genius) who afterwards married his Daughter, and became his Partner in the Buſineſs. The Story goes, that this *John Fuſt* went to *Paris* (but whether before or after his ſettling at *Mentz*, I cannot tell:) and that he there offer'd a great Number of *Printed Bibles* to ſale, as if they were *Manuſcripts*. But the *French* were not to be ſo caught. They conſidered the Number of theſe Books, and their exact Conformity to one another throughout the whole, to a Line, a Word, a Letter, a Point, and that the beſt of *Book-Writers* could not be thus exact, and therefore by indicting of *Diabolical Magick* (or threatning him with it) they at once gave Birth to the Story of Dr. *Fauſtus*, and cauſed him to diſcover the Art. And I doubt not but about this time, very many Books were printed and ſold for Manuſcripts, I having ſeen divers ſuch Books without Dates, which look'd rather older than any I have ſeen with them. I ſpeak now of thoſe that are Set or Compos'd of *Letter*, which with *Printing-Ink* of Lamp-Black and Oyl, and the *Printing-Preſs*, is ſaid to be the Improvement of *Schoeffer* above-mentioned; though *Schrevelius*, with leſs Reaſon, aſcribes the two former to his Countryman *Coſter*.

When *Fuſt* and *Schoeffer* began firſt to Work at *Mentz* is uncertain, but the firſt mention that I find of him, as a Printer at *Mentz*, is in *Schrevelius*, *Harlem*, *pag.* 272. where he ſays that this *Fuſt* (or *Fauſtus* as he calls him) publiſhed *Alexandri Doctrinale cum Petri Hiſpani tractatibus*, *A. D.* 1442. but this and ſome other Books mentioned by Writers on this Subject, are never ſaid to be extant in any *particular Place*, in order to be *conſulted* upon Occaſion; and therefore their *Titles* and *Dates* are not ſo much to be relied upon. But another Date, which though not ſo *Old*, is more *Authentick*, may be found in the above-cited Book of * *Lambecius*, where he ſays he brought away from *Inſpruck*, amongſt other choice Volumes, and placed in the *Imperial* Library at *Vienna*, a Pſalter Printed upon *Parchment*, with this Inſcription at the End, *Præſens Pſalmorum codex venuſtate Capitalium decoratus, Rubricationibuſque ſufficienter diſtinctus, adinventione artificioſa imprimendi ac characterizandi, abſque calami ulla exaratione ſic effigiatus, & ad euſebiam Dei induſtrie eſt conſummatus per* Johannem Fuſt, *Civem Moguntinum, & Petrum Schoffer de Gernszheim, anno Domini milleſimo* CCCCLVII. *in Vigilia Aſſumptionis*. From this time there are conſtant Remains of the Induſtry of theſe Men, and I can mention more Books Printed by them, than the *Durandus* (in the Library of *Baſil* in *Switzerland*) Printed (as a Gentleman who ſaw it told me) *A. D.* 1458. *Joannes Joanuenſis*'s *Catholicon* (in her *Majeſty's* and the

* *p.* 989.

Lord Biſhop of *Norwich*'s Libraries,) Printed 1460. The *Latin Bible* of 1462, yet extant in the *French King's* Library, and in divers *Monaſteries* beyond the Seas, and perhaps in *England.* The *Tully's Offices* Printed both in 1465, and 1466, (if both theſe be not the ſame Edition, the *laſt Sheet* or *Leaf* being compos'd afreſh:) and ſo on till *Schoeffer* work'd for himſelf after the Death of *Fuſt*, and *Schoeffer*'s Poſterity after him. But I willingly forbear the Catalogue, in hopes that this, with that of the other *old Printers* throughout *Europe*, and eſpecially of our *Engliſh Workmen*, with their *Devices*, the *Effigies* of moſt of them, and a Multitude of uncommon Remarks relating to *Writing*, *Printing*, *Parchment*, *Paper*, *Binding*, *&c.* will be communicated to the World, when *Mr. Bagford*'s Papers ſhall be digeſted.

Upon the firſt Diſcovery of the Art by *Fuſt* at *Paris*, or at his firſt Settlement or publick Profeſſion of it at *Mentz*, it quickly ſpread over the beſt Parts of *Europe*, * and was commonly uſed in *other Countries* before 'twas known in *England* (notwithſtanding what ſome Writers do affirm to the contrary;) the firſt Book that we pretend to have been Printed here, being *Hierome* (or rather *Rufinus*) on the *Creed*, Printed at *Oxford*, *A. D.* 1468. To prove this in ſome meaſure (not to mention the Progreſs of *Printing* in other Countries) I inſtance in *Italy*, and particularly *Rome*. Here, not to inſiſt on the large Catalogue of *Printed Books* deſcribed in an Epiſtle to Pope *Xyſtus* IV. Publiſhed at the Beginning of the *V. Tome* of the *Bible* Printed with *Lyra's Commentaries* at *Rome*, *A. D.* 1472, and tranſcribed by *Boxhornius*; I ſhall only relate the Sum of what I meet with in *Bernard Mountfaucon*'s *Diarium Italicum*, *Tom.* 1. *page* 255, 256. 'Tis that *Joannes Alerienſis, in a flattering Epiſtle to Pope Paul* II. (who was elected *A. D.* 1464.) *congratulates him, becauſe Printing was firſt us'd at* Rome, *under his Pontificat.* Which if, ſpoken of the very firſt Practice of the Art at *Rome*, and not of an eſtabliſhed Imprimery, ſeems to be falſe, becauſe this learned Monk, in the ſame Place, ſays *he ſaw a* Lactantius *in the Muſeum* (or Study) *of Monſieur* de la Thuilliere, *which has theſe Words at the End*, *Lactantii Firmiani Inſtitutiones cuſæ in venerabili Manaſterio Sublacenſi anno* 1461. *antepenultima Octobris.* Now unleſs a Man will ſuppoſe Printing to be invented in this Monaſtery, he muſt believe it to be brought hither from *Rome*, which is but about twenty Miles diſtant from it. And the ſame Author ſays, *that* Floravantes Martinellus *in his Roma Sacra, affirms that Printing was practiſed at* Rome *in the Palace of the* Maximi, *A. D.* 1455, *under Pope* Nicolaus V. *by* Conrad Sweynheim *and* Arnold Pannartz, who were both *Germans*, and continued *Printers* there for many Years after.

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* *From theſe* Places, *and from* Books *or Part of* Books, *where, or wherein ſuch ſorts of* Letter *was uſed, the* Printers *do ſtill call their* Letter, Italick, Roman, Engliſh, *&c.* Auſtin, Canon, Pica, Primer, Brevier, *&c.*

The Cuſtom of putting the *Dates* of *Printed Books* at the *End* of them, was taken up in Imitation of divers the middle-aged and recenter Manuſcripts (for I never ſaw or heard of any ancient Manuſcript in *Capital Letters*, either *Greek* or *Latin*, which has a *profeſs'd Date* written in the *firſt hand*;) but here the Inſpector ought to be cautious, leſt he be led into an Error: For ſeveral Manuſcripts at the End have a Date, which may be by ſome underſtood of the time when thoſe individual Copies were *written*, when as they only notify the time when the *Author finiſh'd his Work*. And ſome of theſe Dates, being Printed from the Manuſcripts, have deceived many curious Men. For Example, the firſt Edition of *Lyndwood*, *Paulus à Sancta Maria*, and others which I could name. Beſides, ſome Dates in ancient Printed Books, being not corrected, are falſe; ſuch as a Book Printed in the Beginning of the 16th Century, in the Library belonging to the *Aſhmolean Muſeum* at *Oxford*, which thus pretends to 400 or 500 Years of Age. A *Julius Hyginus* once ſhewed to me by Mr. *Millington* the Bookſeller, Printed at *Paris* (as there put down) *An. Dom.* MCCCCXII. inſtead of MCCCCCXII. For the Printer is mention'd as then living in *l' Origine de l' Imprimerie de Paris*. I have indeed a Book wherein, amongſt other Tracts, is one of an old Print, at the End of which there ſeems to be ſuch a Miſtake, though not ſo eaſily rectified as the former. The words are theſe, *Explicit opuſculum* Enee Sylvii *de duobus amantibus in Civitate Leydenſi Anno Domini Milleſimo* CCCC *quadrageſimo tertio* LEIEN. Now though *Leyden* ſeems to be the Place *where* 'twas Printed, yet 1443 cannot be the time *when*; for juſt before *Sylvius* ſays himſelf, *Vale, ex Vienna quinto Nonas Julias Mo* CCCC *quadrageſimo quarto*. *Sylvius* was elected Pope by the Name of *Pius* I. *A. D.* 1458, and died *A. D.* 1464. Now it may ſeem probable, that if this Tract was Printed after his Election (as ſuppoſe *A D.* 1463.) or even after his Deceaſe, his Papal Dignity might have been remembred; If it be judg'd to have been Printed before his Election, I know none that will allow of Printing at *Leyden*, (or even in *Lyons*) ſo very early.

One Objection may be urg'd againſt what is ſaid of *Koſter*'s or the old Printed Books above-mentioned, being Printed upon Paper about *A. D.* 1430, or ſoon after. For ſome Authors are of Opinion, that Paper made of Linen Rags was firſt made at *Baſil*, by ſome *Greeks* who fled out of their Country after the Sackage of *Conſtantinople*, *A. D.* 1452. in Imitation of the *Cotton Paper*, commonly uſed in the *Levant*. But this can have no force, our Paper being much older: For I have a Piece, the Writing upon which ſeems to be about 350 Years old, and agrees very well with a Charter which I have ſeen of *Thomas Beauchamp* Earl of *Warwick*, bearing Date *A. D.* 1358. and 32 *Edw.* III. In the Archives of the Library belonging to the R. R. Dean and Chapter of *Canterbury*, I ſaw an Inventory of the Goods of *Henry* Prior of *Chriſts Church* there, taken upon his Deceaſe, (as I remember) the 20th Year of K. *Edward* III. and this is written upon *Paper*. In the *Cottonian* Library, though ſearching after other Matters, I could not but obſerve ſeveral Writings upon our *Paper*, in the time of moſt of our Kings and Queens, as high as the 15th of King *Edward* III. and I doubt not but that there are others more ancient in the ſame place. But in the *Eaſt*, the uſe of *Cotton Paper* is much more ancient, and I have in the *Bodleian* Library ſeen an *Arabick* Manuſcript (amongſt thoſe which the Univerſity bought of Dr. *Huntingdon)* written in the 427th of the Year *Hegira*, i. e. *A. D.* 1049, and others in the ſame place, without dates, ſeem older.

Tho' the Invention of the *Rolling-Preſs* is commonly aſcribed to *Lipſius*; yet it ſeems older than his Time, from a printed Book in the *Bodleian* Library, placed LAVD. D. 138. This is a *Miſſale ſecundum uſum Eccleſiæ Herbipolenſis* (i, e. *Wurtzburg* in *Germany*.) *Rodolfus* Archbiſhop of that Church ſets forth in an Inſtrument at the beginning of the Book, the Reaſons why he cauſed this Miſſal to be publiſhed, which Inſtrument bears date the 8th of *November* 1481, by which time he orders all the Copies to be finiſhed by *Jorius Ryſer* his Printer, who ſeems to have done ſo, ſince his Name, and this Year 1481, is written at the end of the Book. Inſtead of a Seal to this Inſtrument is an *Engraven Print*, being the *Arms* of the *See* ſupported by two Angels, and St. *Kilian* (its firſt Biſhop and Protector) behind; as alſo this Prelate's own Arms with thoſe of the *See* in another *Eſcutcheon*, and a very fine *Mantling*. This is extremely well engraven for the time, and equals the Performances of ſome of our beſt Workmen at preſent. The evident Marks of *Preſſure* by the *Plate*, with ſome touch of *Ink* at the *Edges*, the *Roughneſs* of the Print, and other Circumſtances concurring, I thought this muſt needs be wrought off at the *Rolling-Preſs*. I ſhewed it to divers very knowing and curious Gentlemen, to ſeveral *Printers*, *Engravers*, and others working conſtantly at the *Rolling-Preſs*, who all concurr'd (tho' at different times, one not knowing what another had ſaid) that 'twas not only excellently well engraven (and this before *Albert Durer*'s Time) but that it was certainly pull'd from the *Rolling-Preſs*, and could be done no other way. And that this Print was not done after that time, appears from ſeveral Notes written here and there in the Book. One of them ſpecifies that *William Kewſth*, Vicar of St. *Bartholomew*'s Church in *Wurtzburg*, bought this Book the ſame Year 1481, paying eighteen *Florins* for the *Parchment*, *Printing*, *Rubrication*, *Illumination* and *Binding*. By another it appears, that he gave it to the Church for ever. And by ſome others it appears that it remained there during the times of his ſeveral Succeſſors, till the laſt Age, when, as I ſuppoſe, the *Swedes*, under *Guſtavus Adolphus*, plunder'd the Church, and brought it out.

—— *by Mr.* Bagford. *n.* 310. *p.* 2397.

2. The general Notion of moſt Authors is, that we had the hint of Printing from the *Chineſes*; but I am not in the leaſt inclin'd to be of that Opinion, for at that time of Day we had no knowledge of them. I think we might more probably take it from the ancient *Romans*, their Medals, Seals, and the Marks or Names at the bottom of their ſacrifi-

cing Pots, which Antiquities we had amongſt our ſelves in *Europe*, rather than fetch it ſo far. But if it be certain, that Cards are as old as our King *Henry* VI. nothing that I have ſeen or conſidered of, ſeems to give ſo fair an hint for Printing, as the making of Cards; as is evident by the firſt Specimen of Printing at *Harlem*, and by ſome Books in the *Bodleian Library* at *Oxford*, one in *Junius*'s Collection, another in Archbiſhop *Laud*'s, and a third in the ſame, being the Lives of the *Ruſſian* Saints in a thin Folio; the Leaves are not paſted together as the former two, but cut on wooden Blocks, and illuminated. There is alſo another rare Specimen of the firſt in that valuable Collection of Archbiſhop *Parker*, in *Bennet* College Library at *Cambridge*, bound up with a MS. Book; this was ſhewn me at firſt by Mr. *Bullord*, and differs very much from them at *Oxford*; it is the *Life of Chriſt* in Figures, or rather the Types of the Old and New Teſtament. They have not ſo many Specimens of the firſt Printing at *Harlem*, as we have in *England*. I am apt to believe, that if ſome curious Perſons had the Liberty of looking over the Libraries in both Univerſities, and that in *Greſham* College, there might be found other Specimens of the ancient Printing; the aforementioned Books being taken notice of but of late.

The cutting of the Molds or Blocks for making our playing Cards, is after the ſame manner as thoſe for the Books printed at *Harlem*. They lay a Sheet of moiſt or wet Paper on the Form or Block, being firſt lightly bruſh'd over with Ink, made of Lamp-black mix'd with Starch and Water: Then they rub it off with a round Liſt with their Hand, which is done with great Expedition; this is for Picture or Court Cards: Then they paſte them together threefold, the coarſeſt in the middle. They colour them by the help of ſeveral *Patterns* or *Staneſiles*, as they call them; they are Card Paper cut thro' with a Penkniſe, for every Colour, as red, *&c.* (for at the firſt Printing, the Card has only a mere Out-Line:) Theſe Patterns are painted with Oyl-colours, to keep them from wearing out with the Bruſhes; they lay it upon the Picture, and by ſliding a Bruſh that is full and looſe gently over the Pattern, it fixes the Colour into the cut Holes, and leaves it on the Print that is to be a Card, and ſo go through all the Colours you ſee on Cards; but this cannot be ſo well underſtood by a Deſcription, as by ſeeing them perform it. This I humbly conceive to be their way of Printing firſt at *Harlem*, and thoſe Books above-mention'd. This methinks might have been conſidered before this time of Day, if they would have put themſelves to the trouble of inſpecting the old MSS. nine hundred Years old; for the great Letters are done by the Illuminators the ſame way as Card-making; as I ſhall treat of more at large in another Diſſertation.

The next Form of Printing at *Harlem*, was by cutting whole Forms in Wood from MSS. exactly written, and without Pictures: Such I take the *Donatus* to be mentioned in Hiſtories; and this might bear date in 1450, ſome ſay 1440. This may be as plainly demonſtrated, as the former,

mer, ſrom Copy-Books which we have ſeen printed at *Rome*, *Venice*, *Switzerland* and *England*, as high as 1500; and, if I miſtake not, there is a Block cut in Box in the Collection of your *Muſeum* in *Greſham-College*. This writing is harder to perform than either the *Roman*, *Italick*, or any other Letter uſed in printed Books.

The third way of Printing was with ſingle Types made of Wood, but to whom the Honour of the Invention is due, is not very evident; it was then eſteemed ſo great a Rarity that the Printers carry'd their Letters in Bags at their Backs, and got Money at great Mens Houſes by Printing the Names of the Family, Epitaphs, Songs, and other ſmall Pamphlets.

The fourth Improvement of this Noble Art was the Invention of ſingle Types made of Metal. Here we muſt intirely give the Honour to the never to be forgotten *Peter Scheffer* of *Grenſchen*, Servant and afterwards Son-in-Law to *Fauſt*, who entertain'd him to work in his Houſe at *Mentz:* He obſerving how induſtrious his Maſter was every Day to improve this Art, undertook it himſelf; and with much Study and Induſtry, brought it to perfection. After he had made ſeveral Eſſays, at laſt he ſhews it to his Maſter *Fauſt*, who having try'd ſome Experiments with his new invented ſingle Types, finding that it would anſwer his Expectation, was ſo tranſported with Joy, that for his Reward, he promis'd he ſhould marry his Daughter, a very beautiful Damſel, whoſe Name was *Chriſtian*, which ſometime after he performed, and continu'd together improving this Art with great Secrecy, till it became known, and ſpread it ſelf over all *Europe*. Sometimes you have their Names to the Books they printed at the end, and ſometimes not; ſometimes with Dates as high as the Year 1457, as the Pſalms printed by them, now in the Emperor's Library, which *Lambecius* mentions in his *Bibliotheca*, and as low as the Year 1490; and for this we have the Authority of *Eraſmus*, in a Preface to *Livy*, printed at *Baſil* by *Froben*, in 15.. As for *John Guttemburgh*, tho' by abundance of Authors he is ſaid to be the firſt Inventor of Printing, we cannot find one Book with his Name and Printing; but this requires a longer Conſideration, which in its due place I ſhall take notice of. We may rationally conjecture, that printing with Plates of Pewter, Braſs, or Iron, either grav'd or eat with *Aqua fortis*, was firſt practis'd by the working Goldſmiths; for they have a way of taking off the Impreſſions of their Work, by the Smoak of a Lamp, which, perhaps, gave the hint to the graving on Braſs.

Having treated of Printing to ſatisfy the curious, I ſhall ſay ſomething of the ſeveral Advances and Improvements it hath received. The *Harlem* Printing at firſt was a Book with Pictures; they took off the Impreſſion with a Liſt coiled up, as the Card-makers uſe the ſame to this day. But when they came to uſe ſingle Types, they made uſe of ſtronger Paper, with Vellum and Parchment: Then they made uſe of a Preſs, altho'

altho' they afterwards contrived and made it more uſeful, as I ſhall treat of in another place. Neither was their Ink for Printing brought to Perfection at the firſt, but improved by degrees. Rowling-Preſs Printing was not uſed in *England* till King *James* I. and then brought from *Antwerp* by our induſtrious *John Speed.* I ſhall alſo diſcourſe at large of the Invention of making Paper in *Europe* from all the beſt Authors, with large Obſervations of my own; the time when it began in ſeveral Places, more eſpecially in *England*; and I intend to exhibit a Specimen of the Marks of the old Paper, which has not yet been attempted by any.

Book-binding ſhall be handled in all its Parts, its ſeveral Ages and Times: Alſo the Form, Size and Volume, Folding, Sewing, Headbanding, ſeveral ſorts of Boards for Covers, Claſping, Boſſing, *&c.* Alſo in all Countries, as *China*, *Perſia*, *Turkey*, *Greece*, Ancient and Modern *Germany*, *Italy*, *France*, *Holland* and *Spain*; but more particularly *England*. The Devices, *Rebus*'s, and Signs of the ancient Printers will take up a whole Chapter, where their Deſcent and Genealogies ſhall be ſhewn, and how they ſucceeded one another in their Office, or Printing-Houſe. On this Subject I have no Path to follow; but *Draudeus* hath a Tract I find mentioned, that treats of the ancient Devices of the Printers, but after my Inquiry, I could never ſee it, and ſo can receive no Aſſiſtance from it. Alſo *Naudeus*'s Life of *Lewis* XI. hath an Account of *Fauſt*'s printing the Bible in the *Latin* Tongue, his bringing them to *Paris*, and vending them there for MSS. his Troubles and Accuſations before the Parliament, being try'd for a Conjurer.

Since my ſecond Voyage to *Holland*, to ſatisfie my Curioſity and remove ſome Scruples about the Book at *Harlem*, and the Statue of *Coſter*, having recollected my ſelf after my firſt Voyage, and diſcourſing with Mr. *Talman* Jun. about *Holland* and the Statue of *Coſter*; he told me he had ſeen the ſame in *Holland*, and that it was in the *Harlemarſtreet* in *Leyden*. This very much run in my Mind, to be further ſatisfied that it ſhould be in *Leyden* and not *Harlem*, altho' aſſerted by ſeveral of our modern Travellers.

At my laſt being in *Holland*, for my further Satisfaction, tho' I had got Mr. *Ball* to take the Inſcription for me the Year before, in *June* 1705, in the Company of *Walter Clavel*, Eſq; on *Wedneſday* the 23d of *October* 1706, we took Boat for *Leyden*, where we arriv'd about ſix the ſame Day; and next Day in the Morning, in the Company of Mr. *Bovell*, a Student there, who was our Guide into the *Harlemar-ſtreet*, ſo called becauſe it leadeth to the *Harlem* Parts, over the Door of a Glazier's Houſe was the Figure of *Coſter* cut in Wood, and painted with the Inſcription. This Statue was not ſet up by any publick Authority of the Magiſtrates of that City, but by a private Man; and, if I miſtake not, by the Owner of the Houſe, perhaps for the name and ſake of the Street; and, as I ſuppoſe, not older than about 1630. This Statue is done after the graved Print that is in the Book at *Harlem*, or the Painting over the Door of *Laurence Johnſon Coſter*, where they ſay he firſt practis'd the *Art of Printing*; but I rather take it, that he liv'd in this Houſe in his old Age, and was Church-Keeper, or as we call it, *Sexton*; for ſo the Word ſignifies both in the *German* and *Dutch* Language. This afforded me ſome Satisfaction.

Some Days leaving *Leyden*, in Company of my Friends, Mr. *John Bullord*, and Mr. *John Murray*, we ſet forth from *Amſterdam* in a Waggon for *Harlem*, to compare and collate the Book which Mr. *Bullord* had procured for me with that at *Harlem*, it being another Impreſſion in *Quarto*. The Name of the Book at the latter End runs thus: *This Book was finiſhed in the good City of* Culenburgh, *by me* John Veldener, *in the Year of our Lord* 1483, *on the* Saturday *after St.* Matthew'*s Day*; with the Device of the Printer hanging on the Bough or Snag of a Tree, a Cuſtom they much uſed in thoſe Days, as may be ſeen by the Monuments of the Ancients cut on Grave-Stones, not only in the Great Church at *Harlem*, but in ſeveral other Cities in *Holland*: The Title of the Book in *Low Dutch*, the Language in which it is Printed, is, *De Spiegel onſer Behondeniſe*. In *Engliſh*, *The Mirror of our Salvation*.

When we arrived at *Harlem*, much to my Surprize, we found the Houſe of *Coſter* new faced with Plaſter, and the Picture of his Statue, (for it is no other than a Picture in Oyl-Colours) painted on a Board let into the Wall near the Top of the Houſe, although it be a ſmall one. This Houſe was new repaired, and to be let, although when I was there before, it was inhabited by a Cheeſemonger. After viewing the Houſe and the great Church, we directed our Way to the Rector, who is the Schoolmaſter, put in by the Magiſtrates of the City. He not being in the way, his Servant Maid took the Key, and readily gave us Admiſſion into the Prince's Garden, in order to ſhew us the Book, which was remov'd from the Stair-head of the Prince's *Houſſe*, or Houſe, where we ſaw it laſt, to the further End of the Garden, in a little Houſe fitted up for that Purpoſe, facing the Garden. On the Cheſt that it was kept in there was the Date 1618, inlaid in the Wood. Opening it the Maid ſhewed us the Book, where Mr. *Bullord* collated it with the other we brought with us from *Amſterdam*, and found it to agree both in the Words of the Text, and alſo the Pictures; they only differed in this, that being in Folio, with two Pictures in a Page, and the Words Column-wiſe, and twenty five Lines in a Column, containing ſixty Pages, and printed but on one Side, and not paſted together as thoſe at *Oxford* and *Cambridge*. This will enable me to oblige the Curious with a Specimen of the *Harlem* Book, as well as thoſe of *Oxford* and *Cambridge*, the latter I have cut for my Hiſtory of Printing, as I do intend the others.

At the Entrance into the Garden, at the upper End of the Summer-Houſe, on the Right Hand, we ſaw the Statue of *Coſter*, leaning with its Left Hand on the Inſcription, which bore Date 1440; and in its Right Hand the Letter A in a Square, with other Figures, as little Boys naked, and in their Hands A B C, with the Picture of *Fame* holding the Letters C D and E. This was taken from the Story of *Junius* in his *Hiſtory of the Low Countries*, and others from him. The Statue of *Coſter* is painted in Diſtemper, and is no older (as appears by the Date on the Cieling) than 1655.

As *Printing* it ſelf is but another Way of Writing, and brought to Perfection by Degrees, as other Arts; and as Pictures either painted, cut in Wood, or Graved, were called the Laymens Books; for every one could read a Picture, and ſay this is an Houſe, and that a Tree; ſo I may ſay, that the Pictures, or Drawings of the Ancients, gave the firſt Hint of *Printing*; and if the Scribes, in Proceſs of time, had not brought their *Art of Writing* into the Decorum and Uniformity, and Rule in their ſeveral Volumes, the *Printers* could not have followed them ſo exactly in the Imitation of their Letters and Pages of their Books. Pictures firſt were thoſe of Devotion; then the making of Cards was another Introduction to the Invention of *Printing*: The making of Cards I take to be very ancient. For the firſt Specimen of *Printing*, was on one Side only, as that at *Bennet-College*, moſt in Figures, with ſome few Words only on the Side in Labels like that at *Oxford*. The next Step is that Book at *Harlem*; the Deſign of the Prints are better perform'd, and then they came to have not only Lines, but whole Pages of Words, beſides the Pictures on a Page. The next Step was *Ballad-Printing* with the like Pictures, and them but on one Side. The next Improvement of this noble Art, was the cutting of whole Pages on wooden Blocks or Moulds, and Printing on both Sides of the Page; and the firſt Specimen of this Nature was a *Donatus*, and, as Authors ſay, was printed at *Harlem* and at *Mentz*, although ſome ſay a Bible was printed the ſame way 1457.

I ſhall moreover give the Marks of the ancient Paper from the 12th Century down to 1600, in the ſeveral Countries where the *Paper-makers* lived. The Specimens of ancient Pieces of MSS. and alſo of ancient Paper, collected by my ſelf ſome Years ſince, and bound up in two Volumes in large Folio, are now to be ſeen in the Library of his Grace the Archbiſhop of *Canterbury*, in St. *Martin*'s, collected and put together at no ſmall Coſt and Pains; perhaps the firſt of that kind that ever was done in any Part of *Europe*. I conclude with informing you, that in this Treatiſe I ſhall give an Hiſtorical Account of the ſeveral Verſions and Impreſſions of the *Holy Bible*, *Teſtament*, *Pſalms*, *Primer*, and other Books of Devotion, from the Beginning of the *Reformation* down to 1600. Some Collections coming into my Hands of late, wherein I find ſeveral material Paſſages not mentioned by any that have gone before me, I ſhall treat of them in a diſtinct Chapter.

His Collections by Mr. Wanley, *ib. p.* 2407.

3. His Collection conſiſts chiefly of *Title-Pages* and other *Fragments* put together into Books, many of them in ſome ſort of Order and Method, and others not. *Ex. gr.*

In one Volume there are Specimens of *Letters* of all ſorts, as well of thoſe uſed in foreign Countries, as in *England*. In another are Titles and Fragments of *Almanacks* from *A. D.* 1537. downwards; with Titles of

Bibles, *Law-Books*, *&c.* Printed by the *Company of Stationers* in *London.* In other Volumes are the Titles of Books of all kinds, printed by the *London-Printers*, diſpoſed into ſome ſort of Order, *viz.* as to the Subject of the Book, or Dwelling-place of the *Printer*. In others are Title-pages of Books printed in *Oxford* and *Cambridge*. In others, Title-pages of thoſe printed in *Scotland* and *Ireland*. Title-pages and Frontiſpieces, with other Specimens of the Works of our *Engliſh Engravers*. Titles of Books printed by *Roman Catholicks*, *Presbyterians*, *Quakers*, by other *Sectaries*, by *Seditious Perſons*, *&c.*

Cuts of *Monuments*, *Tombs*, *Funerals*, *&c.* in *England*. Cuts of the ſame in Foreign Parts, with the Cuts of the manner of *Executing Criminals*. Cuts with ſome Drawings of Habits of divers Nations, of ſeveral Trades, of *Utenſils*, *Weapons*, *Fountains*, or *Wells*, with other Prints uſeful in *Joyners* and *Maſons* Work. Cuts of Figures in different Poſtures, as *Writing*, *Reading* and *Meditating*; with all the *Utenſils* uſed in Writing, *&c.* during ſome Ages. Cuts of *Schools*. The *Heads* of ſome *Arithmeticians*; *Alphabets*; Specimens of *Knot-work*, and ſome *Great Text* and other Letters. Specimens of *Letter-Graving*. *Heads* of Writing Maſters, *Dutch*, *French*, *Engliſh*. Specimens of Letters Engraven in *Small*; as alſo of *Short Hand*, *&c.* Heads of *Short Hand Writers*, and Specimens of their Works, and many other things. *Title-pages* of *Books*, and *Printers Devices*; Printing in the *Spaniſh Netherlands*, *Spain* and *Portugal*; Titles of Books publiſhed by *Engliſh Catholicks*, Alphabets of *Plantin*'s *Capital Letters*, *&c.* *Title-Pages*, *Alphabets*, *and Printers Devices*, uſed in *Baſil*, *Zurich*, and in other Places in *Switzerland*. The like for the *United Netherlands*. The like for *France*. The like for *Germany*, with ſome others of *Poland*, *Switzerland*, *Denmark*, *Bohemia*, and *France*. The like for *Italy*, with ſome others of *Geneva*, *Sicily*, *&c.*

Collection of *Acts of Parliament*, *Ordinances*, *Proclamations*, *&c.* Regulating *the Preſs*; with many other Papers. *Propoſals* for Printing particular Books. Catalogues of Books, relating to *Painting*, *Printing*, *&c.* Specimens of Paper differently Coloured. *Marks* on the Outſides of Reams of Paper; with *Orders*, *Caſes*, *Reaſons*, *&c.* relating to the *Manufacture*. Old *Prints* or *Cuts* from *A.D.* 1467. with the *Effigies* and *Devices* of many *Printers*, *Foreigners* and *Engliſh*; with other *Cuts* and Specimens of *Paper*, *&c.* Collections of *Epitaphs* of the *Printers* in *Baſil*; with the Life of *John Froben*; Catalogues of Books, *&c.* Collections relating to the Lives of the *Engravers* of divers Countries.

Titles of Books printed in moſt Parts of *Europe*, before the Year 1500. Collection of *Patents* for Printing *Law-Books*, *&c.* Some *German* Cards. With many other Volumes of Collections of the Kinds above mentioned, though not ſo well ſorted.

And theſe *Title-Pages* of *Books* are really uſeful, upon many Accounts, *viz.* as being authentick and exact, when, as in moſt *Catalogues*, the *Titles* are abbreviated and otherwiſe imperfect. Beſides, theſe Titles informed me of many Books I had never heard of before; and from them I have been enabled to enquire for ſeveral Books, ſome of which I have ſince procured to my great Satisfaction. And it is my Opinion, that there are but few curious Men, but, upon the View of this Collection, will own they have here met with ſeveral *Titles*, or other *Fragments of Books*, in their ſeveral ways, which they knew not of before. And thus we ſee, that a ſingle Leaf of Paper, though not valuable in its ſelf; yet when come to be Part of a Collection, may be of good Uſe, not only in reſpect of the *Matter* it treats of, but as to the *Mark of the Paper*, *the Date*, *Printer's Name*, *Country*, *Title*, *Faculty*, *&c.*

Obſervables in Mr. Thoresby's *Muſeum, n.*277.*p.*1070.

IV. I have the outward Skin of the Maw of a Fiſh that was taken at *Macaſſar*, *Febr.* 16$\frac{80}{81}$. and was given to Mr. *Rob. Midgley* at *Batavia* by a *Dutch-man*, who took it out of the Fiſh. That the Fibres or Veſſels do curiouſly and naturally reſemble a Tree, with its Stem, Branches, Leaves, *&c.* will appear by the encloſed Figure of it, which, though but ſlenderly performed, is the beſt I have time to do now, and is ſo like the Original that it will ſave the Labour of any further Deſcription, (for 'tis exactly the Bigneſs and Shape of this Draught,) ſave that the Skin is very thin, whitiſh, and tranſparent, and the Veins that compoſe the Stem and greater Branches, are now rather black than dark red, as I preſume they were at firſt, the Leaves of a ſort of dark and faded green, variegated. The *Cryſtal* was given me by Dr. *Jabez Cay* of *Newcaſtle*, who brought it from *Milan*: whoſe Deſcription I will make bold with, only premiſing his Arguments upon a ſort of *Spar* within a *Flint*, ſent me at the ſame time. That within the *Flint* (ſays he) ſeems to differ from the reſt of its Subſtance, and ſomewhat to reſemble Spar: Though after all, *Spar* being nothing elſe but a *Cryſtaline* ſort of *Lime-ſtone*, it differs not from *Flint* in Reality, but only in Appearance, *i. e.* in the manner of *Concretion*, though if the incloſed Matter had, in its Nature, differ'd from the reſt of the Stone, the thing had not been very uncommon, it being uſual enough for Stones (eſpecially thoſe of a globular or oval Form) to have Coat upon Coat, and thoſe Coats ſometimes very different one from another, ſome of them ſoft, ſome hard, nay, ſometimes after a long Space of time, one of theſe Coats will ſhrink from another, after the manner of a Kernel when the Shell grows dry; and then if the encloſed Subſtance continue ſoft and marly, they call that Stone *Geodes*; but if ſtony, it makes one of thoſe rattling Stones that are known by the Name of the *Ætites*, or Eagle-Stone. To confirm what I have here advanc'd, it were eaſy to prove by many Inſtances that it is no unuſual thing for Stones to encloſe Subſtances of a very differing Nature from themſelves; the *Shells* in the *Suſſex Marble*, herewith ſent you, is one Proof of this Matter, and the *Stones* found in our *Coal-pits*, and known amongſt the Workmen by the Name of *Cat-heads*, may ſerve for another; they are found in a particular *Stratum* near the Coal, and encloſe a *Fern*, or ſometimes *Polypody Leaf* in the

Plate 17.
Fig. 5.

the middle of them; and for that Reaſon being ſtruck with a Hammer very readily break there: I think they are a ſort of *Iron Stone*, akin to that which they call in *Staffordſhire Ballmine*, and Dr. *Liſter*, *Minera ferri pilæformis*; they have it upon the Weſtern Coaſts near *Whitehaven*, and call it there by the Name of *Cat-ſcamps*. I have ſeen of it too upon the *Yorkſhire* Coaſts in *Robin Hood*'s Bay: You may if you pleaſe, till I find a better Name, call it *Lapis mineræ ferri, Pilæformi ſimilis, in cujus Meditullio, unum vel plura filicis folia repræſentantur*. (I have ſince, from my ſaid worthy Friend receiv'd Specimens of both ſorts.) And to give you an Inſtance that *one and the ſame Piece of Rock does not always ſhoot into Stone at one and the ſame time, but firſt one Part of it and then another*, and they too not after the ſame regular manner, but irregularly enough, I have ſent you a piece of *Rock Cryſtal*, where you may eaſily obſerve the *modus concreſcendi* in the middle to have differed from that of the outſide; nay, ſometimes I have ſeen in the middle of ſome tranſparent Stones a ſmall drop that never would take the ſolid form of the reſt of the Stone at all. The third Curioſity is a piece of an *Iron-bolt* (two Inches long) found in a *Stone* Quarry, now return'd into *Iron Ore* again; this being a Property that Iron has, and no other Metal, as Dr. *Liſter* obſerves in his Journey to *Paris*.

The fourth is *Copper Ore* ſo regulated, ſhot into an *Octoedrous* Form, which has eight ſolid Triangles, and conſequently ſix angular Points; my ſaid Couſin receiv'd it from the copper Groves at *Fallum*, where very many of the ſame Form were then found.

Of Pewter Money, coin'd in Ireland, *by Mr.* Tho. Putland *to Mr.* Thoreſby. *n.* 297 *p.* 1875.

V. King *James* II. having turned all the Braſs Guns of *Ireland*, and all the Braſs and Copper Veſſels of Proteſtants, that he could ſeize, into Coin, *viz.* Half-Crowns ſomewhat bigger than an *Engliſh* Half-penny, Shillings broader but not ſo thick as a Farthing, and Six-pences in proportion; it was order'd to paſs current in all Payments, even in Bonds, and diſcharge of Judgments and Statutes; (inſomuch that if Ages to come knew not the reaſon, they would admire to be told, that there was a time when Men abſconded, to avoid receiving their Debts, as many here did:) But theſe ſtocks of Metal being all ſpent (which he began to Coin in *June* 1689.) and no Circulation to bring them back into his Treaſury, he call'd in all that he had coined, and the Half-Crowns, which before were ſtamped with a Face, were re-ſtamped with his *Effigies* on Horſeback, and then paid out to thoſe who brought them in, as Crowns; and the ſmaller Coins were melted down, and re-coined again under the ſame Denomination, but with leſs Metal. After the turn was ſerved by this Stratagem, he had not wherewithal to import Copper and Braſs; but, for want of it, fell foul on the Pewter-Diſhes, *&c.*—— And the Piece I ſent you of that Metal was coined for five Shillings; and the Proclamation to make it paſſable was as ready as the Stamps, for it was prepared: But Kin g*William* paſſing the *Boyne*, prevented their proclaiming it. There was very little of it coined, for our Government could meet with none of it; until one Day, rummaging all their tinkerly Treaſure, that they had left behind them in *Dublin* when they were routed, by accident I met with one Bag of one hundred and fifty of thoſe Pieces. So that the Piece I ſent you, altho' its of no intrinſick Value, is a Rarity; and had I thought it would have been acceptable, I would have ſent you a Specimen of every ſort that he had coined and re-coined here.

This valuable Curioſity has the ſame Inſcription on both ſides, as the common Braſs Crowns; but there is this Legend added upon the Rim of it, *MELIORIS TESSERA FATI. ANNO REGNI SEXTO.*

VI. The Equality of Males and Females is not the Effect of Chance but Divine Providence, working for a good End, which I thus demonſtrate:

Of the conſtant Regularity obſerv'd in the Births of both Sexes, by Dr. Arbuthnott. *n.* 328. *p.* 186.

Let there be a Die of two ſides, M and F, (which denote Croſs and Pile), now to find all the Chances of any determinate Number of ſuch Dice, let the Binome $M+F$ be raiſed to the Power, whoſe Exponent is the Number of Dice given; the Co-efficients of the Terms will ſhew all the Chances ſought. For example, in two Dice of two ſides $M+F$ the Chances are $M^2+2\,MF+F^2$, that is, one Chance for M double, one for F double, and two for M ſingle and F ſingle; in four ſuch Dice there are Chances $M^4+4\,M^3\,F+6\,M^2\,F^2+4\,MF^3+F^4$, that is, one Chance for M quadruple, one for F quadruple, four for triple M and ſingle F, four for ſingle M and triple F, and ſix for M double and F double; and univerſally, if the Number of Dice be *n*, all their Chances will be expreſſed in this Series.

$M^1+\frac{n}{1}\times M^{n-1}\,F+\frac{n}{1}\times\frac{n-1}{2}\times M^{n-2}\,F^2+\frac{n}{1}\times\frac{n-1}{2}\times M^{n-3}\,F^3+$, &c. It appears plainly, that when the Number of Dice is even, there are as many M's as F's in the middle Term of this Series, and in all the other Terms there are moſt M's or moſt F's. If therefore a Man undertake with an even Number of Dice to throw as many M's as F's, he has all the Terms but the middle Term againſt him; and his Lot is to the Sum of all the Chances, as the Co-efficient of the middle Term is to the Power of 2 raiſed to an Exponent equal to the Number of Dice: ſo in two Dice his Lot is $\frac{2}{4}$ or $\frac{1}{2}$, in three Dice $\frac{6}{16}$ or $\frac{3}{8}$, in ſix Dice $\frac{20}{64}$ or $\frac{5}{16}$, in eight $\frac{70}{256}$ or $\frac{35}{128}$, &c.

To find this middle Term in any given Power or Number of Dice, continue the Series $\frac{n}{1}\times\frac{n-1}{2}\times\frac{2}{3}$, &c. till the Number of Terms are equal to $\frac{1}{2}n$. For example, the Co-efficient of the midde Term of the tenth Power is $\frac{10}{1}\times\frac{9}{2}\times\frac{8}{3}\times\frac{7}{4}\times\frac{6}{5}=252$, the tenth Power of 2 is 1024, if therefore A undertakes to throw with ten Dice in one throw an equal Number of M's and F's, he has 252 Chances out of 1024 for him, that is, his Lot is $\frac{252}{1024}$ or $\frac{63}{256}$, which is leſs than $\frac{1}{4}$.

It will be eaſy by the help of Logarithms, to extend this Calculation to a very great Number, but that is not my preſent Deſign. It is viſible from what has been ſaid, that with a great Number of Dice, A's Lot would become very ſmall; and conſequently (ſuppoſing M to denote Male and F Female) that in the vaſt Number of Mortals, there would be but a ſmall part of all the poſſible Chances, for its happening at any aſſignable time, that an equal Number of Males and Females ſhould be born.

It is indeed to be confeſſed that this Equality of Males and Females is not Mathematical but Phyſical, which alters much the foregoing Calculation; for in this Caſe the middle Term will not exactly give A's Chances, but his Chances will take in ſome of the Terms next the middle one, and will lean to one ſide or the other. But it is very improbable (if mere Chance govern'd) that they never would reach as far as the Extremities: But this Event is wiſely prevented by the wiſe Oeconomy of Nature; and to judge of the Wiſdom of the Contrivance, we muſt obſerve that the external Accidents to which Males are ſubject (who muſt ſeek their Food with danger) do make a great Havock of them, and that this loſs exceeds far that of the other Sex, occaſioned by Diſeaſes incident to it, as Experience convinces us. To repair that Loſs, provident Nature, by the Diſpoſal of its wiſe Creator, brings forth more Males than Females; and that in almoſt a conſtant proportion. This appears from the annexed Tables, which contain Obſervations for eighty two Years of the Births in *London*. Now, to reduce the whole to a Calculation, I propoſe this.

Problem. A lays againſt B, that every Year there ſhall be born more Males than Females: To find A's Lot, or the value of his Expectation.

It is evident from what has been ſaid, that A's Lot for each Year is leſs than $\frac{1}{2}$; (but that the Argument may be ſtronger) let his Lot be equal to $\frac{1}{2}$ for one Year. If he undertakes to do the ſame thing 82 times running, his Lot will be $\frac{1}{2}\Big|^{82}$, which will be found eaſily by the Table of Logarithms to be $\frac{1}{4836\ 0000\ 0000\ 0000\ 0000\ 00000}$. But if A wager with B, not only that the Number of Males ſhall exceed that of Females, every Year, but that this Exceſs ſhall happen in a conſtant Proportion, and the Difference lye within fix'd limits; and this not only for 82 Years, but for Ages of Ages, and not only at *London*, but all over the World; (which 'tis highly probable is Fact, and deſigned that every Male may have a Female of the ſame Country and ſuitable Age) then A's Chance will be near an infinitely ſmall Quantity, at leaſt leſs than any aſſignable Fraction. From whence it follows, that it is Art, not Chance, that governs. There ſeems no more probable Cauſe to be aſſigned in Phyſicks for this Equality of the Births, than that in our firſt Parents Seed there were at firſt formed an equal Number of both Sexes.

Scholium. From hence it follows, that Polygamy is contrary to the Law of Nature and Juſtice, and to the Propagation of human Race; for where Males and Females are in equal number, if one Man takes twenty Wives, nineteen Men muſt live in Celibacy, which is repugnant to the Deſign of Nature; nor is it probable that twenty Women will be ſo well impregnated by one Man as by twenty.

Chriſten'd.

Chriſtened.

Anno.	*Males.*	*Females.*
1629	5218	4683
30	4858	4457
31	4422	4102
32	4994	4590
33	5158	4839
34	5035	4820
35	5106	4928
36	4917	4605
37	4703	4457
38	5359	4952
39	5366	4784
40	5518	5332
41	5470	5200
42	5460	4910
43	4793	4617
44	4107	3997
45	4047	3919
46	3768	3395
47	3796	3536
48	3363	3181
49	3079	2746
50	2890	2722
51	3231	2840
52	3220	2908
53	3196	2959
54	3441	3179
55	3655	3349
56	3668	3382
57	3396	3289
58	3157	3013
59	3209	2781
60	3724	3247
61	4748	4107
62	5216	4803
63	5411	4881
64	6041	5681
65	5114	4858
66	4678	4319
67	5616	5322
68	6073	5560
69	6506	5829

Chriſtened.

Anno.	*Males.*	*Females.*
1670	6278	5719
71	6449	6061
72	6443	6120
73	6073	5822
74	6113	5738
75	6058	5717
76	6552	5847
77	6423	6203
78	6568	6033
79	6247	6041
80	6548	6299
81	6822	6533
82	6909	6744
83	7577	7158
84	7575	7127
85	7484	7246
86	7575	7119
87	7737	7214
88	7487	7101
89	7604	7167
90	7909	7302
91	7662	7392
92	7602	7316
93	7676	7483
94	6985	6647
95	7263	6713
96	7632	7229
97	8062	7767
98	8426	7626
99	7911	7452
1700	7578	7061
1701	8102	7514
1702	8031	7656
1703	7765	7683
1704	6113	5738
1705	8366	7779
1706	7952	7417
1707	8379	7687
1708	8239	7623
1709	7840	7380
1710	7640	7288

Of Man's feeding on Fleſh, by Dr. Wallis. *n.*269. *p.* 769.

VII. 1. I remember to have read (about fifty Years ago) in one of *Gaſſendus's* printed Epiſtles, (printed among ſome previous Pieces of his, before the body of his Works was publiſhed,) a ſuggeſtion of his, (which he ſeems to eſpouſe as his own Opinion) as if he thought it not (originally) natural for *Man* to feed on *Fleſh*; though by long uſage (at leaſt ever ſince the Flood) we have been accuſtomed to it, and it is now familiar to us; but rather on Plants, Roots, Fruits, Grain, *&c.* And I take it to be the Opinion of many Divines, that *before the Flood*, Men did not uſe to feed on Fleſh, becauſe of what we have in *Gen.* ix. 3. where God ſays to *Noah*, (after the Flood,) *Every moving thing that liveth, ſhall be meat for you, even as the green Herb have I given you all things:* Compared with *Gen.* i. 29. where God ſays to *Adam*, *I have given you every Herb bearing Seed, and every Tree in the which is the Fruit of a Tree yielding Seed, to you it ſhall be for Meat*; but without any intimation of his feeding on the *Fleſh of Animals*, which ſeems to be an inſinuation to that purpoſe, and is commonly taken ſo to be.

Yet, I confeſs, I have ſome doubt therein remaining, ſeeing that we find, very early, that *Abel* was a *Keeper of Sheep*, as well as *Cain* a *Tiller of the Ground*, both Imployments ſeeming equally in order to their Food and Suſtenance. And their firſt *Cloathings* were the *Skins* of Animals. It may perhaps be thought, that theſe Animals were *Slain* for *Sacrifice*, and the *Sheep* fed only for that purpoſe, but even their Sacrifices ſeem to have been offered but as a Portion (or Firſt-fruits) of things appointed for Food; and that as *Cain* was not to ſacrifice the *whole* Fruit of his *Tillage*, ſo neither was *Abel* the whole Product of his *Sheep*, but the beſt thereof (the Firſtlings of his Flocks, and the Fat thereof) and reſerving the reſt for his own uſe. And it cannot ſeem likely, that God would give to *Noah* after the Flood, a greater Dominion over other Animals, than had been given to *Adam*, in Paradiſe *before the Fall*. And I ſhould then conſider this Permiſſion to *Noah*, not as contra-diſtinct from that to *Adam*, (as of what is now permitted, which before were not;) but rather as Introductive of the *Prohibition* which preſently follows, to wit, Tho' he might eat Fleſh, even as the green Herb, (ſo far as it might be wholſome Food:) yet, *not with the Blood thereof*; that is, not *Raw Fleſh*; not *carnem crudum*, or *carnem cum cruore*. I add alſo, that the ſame Rule is given to other Animals, *Gen.* i. 30. as is to Man, at ℣. 29. *I have given them every green Herb for Meat:* Yet there are, we know, many carnivorous Animals, without any further Permiſſion that we know of.

I ſhall conſider it (with him) as a Queſtion in Natural Philoſophy, whether it be proper Food for Man.

The conſideration inſiſted upon by *Gaſſendus*, is from the Structure of the *Teeth*, (and, as I remember this only) that our Teeth are moſtly either *Inciſores*, or *Molitores*; not ſuch as (in carnivorous Animals) are proper to *tear Fleſh*, except only four, which are called *Canini:* As if Nature had rather furniſhed our Teeth, for *cutting* Herbs, Roots, *&c.* and for bruiſing Grain, Nuts, and other hard Fruits, than for *tearing* Fleſh, as carnivorous Animals do, with their Claws, and ſharp Teeth. And, even when we feed on Fleſh, it is not without a preparative *Coction*, by boiling, roaſting, baking, *&c.* And, even ſo, we forbid it to Perſons in a Fever, or other like diſtempers, as of too hard digeſtion. And *Children* (before their Palates are vitiated by cuſtom) are more fond of *Fruits* than of *Fleſh-meat.* And their breeding *Worms* is wont to be imputed to their *too early* feeding on *Fleſh.*

This Conjecture did preſently ſuggeſt to me another ſpeculation. There is in Swine, Sheep, Oxen, and, I think, in moſt Quadrupeds that feed on Herbs or Plants, a long *Colon*, with a *Cæcum* at the upper end of it, or ſomewhat equivalent, which conveys the Food, by a long and large Progreſs, from the Stomach downwards, in order to a ſlower Paſſage, and longer ſtay in the Inteſtines: But in Dogs, of ſeveral kinds, and I ſuppoſe, in Foxes, Wolves, and divers other Animals which are carnivorous, ſuch *Colon* is wanting; and, inſtead thereof, a more ſhort and ſlender Gut, and quicker Paſſage through the Inteſtines.

That which I would propoſe hereupon is, that you would conſider, whether it do generally hold, or how far forth, that Animals which are not carnivorous, have ſuch *Colon*, or ſomewhat equivalent; and that thoſe which are carnivorous have it not. For if ſo, it ſeems to be a great Indication, that Nature, which may be reaſonably preſum'd to adapt the Inteſtines to the different ſorts of Aliments that are to paſs through them, doth accordingly inform us, to what Animals Fleſh is proper Aliment, and to what it is not; and that from thence we may judge more ſolidly, than from the Structure of the Teeth only, whether or no Fleſh were deſigned as proper Food for Man.

Now it is well known, that in *Man*, and, I preſume, in the Ape, Monkey, Baboon, *&c.* ſuch *Colon* is very remarkable; and the like in your ingenious and accurate * Diſſection of your *Homo Sylveſtris*, which may therefore be thence conjectured, not to belong naturally to the carnivorous Tribes, if that rule hold. 'Tis true, that the *Cæcum* in Man is very ſmall, and ſeems to be of little or no uſe: But in a *Fætus*, it is in Proportion much larger than in Perſons adult. And it's poſſible, that our cuſtomary Change of Diet, as we grow up, from what originally would be more natural, may occaſion its ſhrinking into this contracted Poſture. But I add this alſo, that *Man's* being indu'd with *Reaſon*, doth ſupply the want of many things, which, to other Animals may be needful. Man is not covered with ſuch quantity of Hair or Feathers all over his Body, which to other Animals ſerve for Cloaths; but can, by his uſe of Reaſon, ſupply himſelf with Cloaths ſuitable to every Climate, and different Seaſons. He is not furniſhed with Claws, Hoofs, Horns, *&c.* which ſerve for *Arms* to other Animals, but can, by the uſe of his Reaſon, ſupply himſelf with Weapons, and other Inſtruments for dif-

* *v.* Ph. Tranſ. *n.* 256.

ferent Occaſions, to much better advantage. And, in the preſent caſe tho' *raw Fleſh* be not proper, as 'tis to ſome other Animals, he can by preparative Coctions, and other Expedients, render it more agreeable. Nor is he wholly deſtitute of *Dentes Canini*; but is indeed furniſhed with all ſorts of Teeth, for all ſorts of wholſome Food. I take the Sheep, the Goat, the Swine, the Oxe, the Aſs, the Camel, the Elephant, the Hart, the Hare, the Rabbet, the Mouſe, *&c.* not to be carnivorous; but the Dog, the Wolf, the Fox, the Cat, the Lyon, the Leopard, the Tyger, *&c.* to be naturally carnivorous, which of all theſe have, or have not the *Colon*, or what other diſtinctive Mark may be obſerved between theſe different Tribes of Animals, I think may deſerve a ſerious Conſideration.

An Anſwer by Dr. Tyſon, *ib. p.* 774.

2. The Argument you propoſe from the Conformation of the *Inteſtines*, why *Man* ſhould not be *carnivorous*, ſeems far more rational than that which *Gaſſendus* urges, from the Structure of the *Teeth*. But, before I come more particularly to conſider your *Hypotheſis*, give me leave to remark, that, had *Man* been deſign'd by Nature not to have been a *carnivorous Animal*, no doubt there would have been obſerved, in ſome part of the World, Men which did not at all feed upon Fleſh. But ſince no Hiſtory (as I know of) furniſhes us with ſuch an inſtance, I cannot but think what hath been done univerſally by the whole *Species*, muſt be *Natural* to them. What the *Pythagoreans* did, in *abſtaining from Fleſh*, was upon the Notion of a μετεμψύχωσις, or *Tranſmigration of Souls*, a miſtake in their Philoſophy, and not a Law of Nature. And, tho' in ſome Countries Men feed more freely on Fleſh, in others more ſparingly, this is owing to their own Choice, from the Advantage they find thereby. Nature having given Mankind *Reaſon*, he can, or ought to elect what Food he finds moſt agreeable to him, in the Climate he lives in; and is not determined to any one ſort, but has liberty to all. And 'tis as probable, that the *Ante-diluvial* World had ſo likewiſe.

We ſhall conſider it as a Queſtion in *Natural Philoſophy*; Whether from the Obſervation of the Structure of the Parts in *Man*, we can find reaſon to think Nature did, or did not, aſſign him to be *Carnivorous*. For I am of *Gaſſendus* his Opinion, *Licet ex conformatione Partium Corporis Humani, conjecturas deſumere ad Functiones merè Naturales*. For, all the Knowledge we have of the *Uſes* of the Parts in Animal Bodies, is by obſerving Nature's wonderful Contrivance in the Formation of them; who moſt wiſely adapts them to the *Uſes* they are deſigned for. Not becauſe they are caſually ſo and ſo formed, are they neceſſarily put to ſuch and ſuch Uſes: But therefore they are ſo contrived, that they may perform ſuch Offices in the Oeconomy of Animal Bodies, as Nature intended them for. *Longe proinde faceſſat illa Empedoclis, Epicuri, aliorumque Opinio, ſc. Membra Animalium non eſſe facta propter Uſum; ſed, Membris ita caſu factis, & coaleſcentibus, ipſorum uſum Accommodatione Experientiaque varia adinventum*, ſaith the ſame *Gaſſendus*.

I come therefore now more cloſely to our Buſineſs. And conſider the Obſervation you have made of the different Formation of the *Inteſtines* in Carnivorous Animals, from thoſe that are to be met with in ſuch as do not feed upon Fleſh, but other Food. And indeed this ſeems to me to be of far greater weight, and to carry more ſtrength in it, than any thing I have met with before. And all the Inſtances you give are very true.

We ſhall therefore firſt of all obſerve, That the *Ductus Alimentalis* (for ſo I call the *Gula*, the *Stomach*, and *Inteſtines*; all which make but one continued *Canalis* or *Ductus*;) This *Ductus*, I ſay, is properly the true *Characteriſtick* of an Animal, or *Proprium quarto modo*. For there is no *Animal* but hath ſuch a *Ductus*; and whatſoever hath ſuch a *Ductus*, may properly enough be ranged under the *Claſſis* of *Animals*. *Plants* receive their Nouriſhment by numerous Fibres of their Roots, but have no common *Receptacle* for the digeſting the Food received, or *Vent* for carrying off the Recrements: But in all, even the loweſt Degree of Animal Life, we may obſerve a *Stomach* and *Inteſtines*; even where we cannot perceive the leaſt Formation of any *Organ* of the *Senſes*, unleſs that common one of *Tactus*; as in an *Oyſter*. Where alſo we may obſerve a ſenſible *Muſcular Motion*, or Contraction; though it would be difficult to aſſign what *Part* ſhould be reckoned the *Brain*, or *Medulla Spinalis*, from whence the *Nerves* ariſe that give it ſo ſtrong a Motion. Now this *Ductus* being ſo principal a *Part* in an Animal, and its *Uſe* being for the receiving and digeſting the *Food*, and diſtributing the *Chyle*; 'tis reaſonable to ſuppoſe, that, according to the Difference of the Food, the Structure of the *Organ* ſhould be alſo different; or, where the *Organ* was the ſame, there the *Uſe* was the ſame too, for the receiving, digeſting and diſtributing the ſame ſort of *Food*. Man therefore having theſe Parts formed, not like Carnivorous Animals, as you well obſerve; but more reſembling thoſe that live on Herbs, Roots, Fruits, *&c.* it may ſeem reaſonable to conclude, that Nature never deſigned him to live on Fleſh; But that the Wantonneſs of his Appetite, and a depraved Cuſtom, had inured him to it. For, as *Gaſſendus* remarks in the ſame *Epiſtle*, I have ſo often quoted, (*viz. Epiſt.* Jo. Bapt. Helmont. *operum*, *Tom.* 6. *pag.* 19.) Cuſtom may make that ſeem natural to us, which Nature never intended. As he inſtances in a *Lamb* that was bred on Ship-board, which refuſed the green Paſture of the Fields, for the Diet it was formerly uſed to. And I have often ſeen here in *London* (and it being a thing ſo unuſual, I take leave to mention it) a *Horſe*, that, with a great deal of Pleaſure, would eat *Oyſters*, ſcranching them, Shell and all, between his Teeth, and ſwallowing them; And this he took to by Accident, being left at a Tavern-door, where ſtood a Tub of Oyſters: And ſince hath frequently done it, whenever they were offered him. Now *Gaſſendus* obſerves, that *Children* (from whom he thinks we may better take the *Inſtincts* of Nature, than from our Appetites when depraved by Cuſtom) are much fonder of *Fruit* than of any *Fleſh* that is offered them; and therefore he ſuppoſes it more natural to them.

The *Inſtance* you give, wherein the Structure of the *Inteſtines* of Carnivorous Animals is different from that in Men, is, that the former want a *Colon*; whereas in Men there is a very large one, which is not to be obſerved but in ſuch Animals as live upon Fruits, Roots, Herbs, *&c.* What therefore you propoſe to me, is to conſider, *Whether it does generally hold (or how far forth) that Animals that are not Carnivorous have ſuch a* Colon, *(or ſomewhat equivalent) and thoſe that are Carnivorous have it not.* I ſhall begin with thoſe *Animals* that are *Carnivorous*, and have no *Colon*, or large *Cæcum*. For though they may have the *Appendicula Vermiformis* (as ſome Anatomiſts call it) yet if that is not extended or filled with the *fæces*, which the other Guts contain, I think it not properly to be eſteemed as a diſtinct Gut, or to come into that Number, ſince here it does not perform the Office of a Gut, in containing the Food or Excrement. So, in Man, in Dogs, and other Animals, when it is thus contracted, I exclude it out of the Number of the *Inteſtines*, though by Uſe and Cuſtom, (but I ſee no reaſon for it) 'tis commonly reckoned one of the *Inteſtina craſſa*.

Animals therefore that have no *Colon*, or large *Cæcum*, though ſome of them have this *Appendicula Vermiformis*, and are *Carnivorous*, I reckon:

1. The *Dog-kind*; under which, beſide their own *Species*, may be included the *Fox*, the *Wolf*, the *Coati Mondi*, the *Badger*, the *Otter*, *&c.*

2. The *Vermin-kind*; as the *Weeſel*, the *Fitchet*, the *Polecat*, the *Martin*, *&c.* Both theſe Kinds have a Bone in the *Penis*; have no *Colon* or *Cæcum*; ſome have the *Appendicula Vermiformis*; and all are *Carnivorous.*

3. The *Cat-kind*; to which may be reduced, beſides their own *Species*, the *Lion*, the *Tiger*, the *Leopard*, the *Lynx*, the *Catamountain*, *&c.* 'Tis true, the *French Memoirs for the Hiſtory of Animals*, tell us, that a *Lion* has a *Colon* eighteen Inches long, and an *Appendicula Vermiformis* three Inches; and that in a *Lioneſs* the *Colon* was two Foot, and the *Cæcum* two Inches long. Now I queſtion whether we may properly call this a *Colon* or no. For though the Gut about this Place may be more extended than in others, yet not having thoſe *Ligaments* whereby the Gut is corrugated into *Cells*, as in a human Body, I think ſtrictly it does not deſerve that Name. So in a *Cat*, the Inteſtine, at the Place of the *Colon*, is larger, but, for the ſame reaſon, ſhall not call it a *Colon.* And though a Cat has a ſmall Projection of the Gut, which may be called a *Cæcum*, becauſe it contains *fæces*; yet, ſince 'tis ſo very ſhort, we will not inſiſt on it. 4. A *Bear* hath no *Colon* or *Cæcum*. 5. A *Mole*, which feeds on *Worms* and *Inſects*, has no *Colon* or *Cæcum*. In the next Place we will conſider thoſe *Animals* that are not *Carnivorous*, but live upon Herbs, Fruits, Roots, *&c.* all which have a *Colon*, or *Cæcum*, or both; For, I think it much the ſame, whether they have either one of theſe only, or both; provided that the Capacity of the Gut there be large and extended, and do contain *fæces*. I will enumerate firſt thoſe Animals that have both a *Colon* and a *Cæcum*, or at leaſt a *Colon*. As,

1. The *Horſe-kind*; in which may be included the *Aſs*, *Mule*, *&c.* which have a large *Colon* and *Cæcum*. 2. The *Elephant* hath a great *Colon* and *Cæcum*. 3. The *Dromedary* and *Camel*, a long *Colon*. 4. The *Swine-kind*, whoſe *Species* is numerous, have a large *Cæcum* and *Colon*. 5. The *Guiny-pig*, a *Colon* and *Cæcum*. 6. The *Caſtor*, or *Beaver*, has a large *cellulated Colon* and *Cæcum*. 7. The *Hare-kind*, has a large *Colon* and *Cæcum*. The *Cæcum* in the *Rabbit* is very long, and in the middle, a *cochlear Valve*. 8. The *Ape* and *Monkey-kind*, have a *cellulated Colon*, and ſhort *Cæcum*.

Now there are ſeveral Animals that have a large *Cæcum* and no *Colon*, and theſe too are not *Carnivorous*, but live upon Graſs, Fruits, Roots, *&c.* as, 1. The *Neat-kind*, as the *Oxe*, the *Barbary Cow*, *&c.* 2. The *Sheep-kind*, which is numerous. 3. The *Stag-kind*, to which may be referred, the *Elk*, the *Rain-deer*, the *Stag* of *Canada*, *&c.* 4. The *Goat-kind*. 5. The *Gazella* or *Antelope*. 6. The *Squirrel-kind*. 7. The *Rat-kind*.

By all which Liſts, you may plainly perceive, what good grounds you have for forming your Notion; ſince there are ſo many Animals that are *Carnivorous*, that have no *Colon* or *Cæcum* at all; and, on the other hand, how vaſt a Number are there that are not *Carnivorous*, that have either a *Colon* or *Cæcum*, or both.

But we may be miſtaken in the Concluſion we may be apt to draw from hence: and may as well argue, that becauſe the *Neat-kind*, the *Stag-kind*, the *Goat-kind*, and the *Sheep kind*, that live on Herbage, have *four Stomachs*, therefore thoſe that have not four Stomachs, were not deſign'd by Nature to be *Graminivorous*. Now the *Horſe-kind*, the *Hare kind*, *&c.* have but one Stomach, and yet their Food is Graſs. And the Caſe is here the more remarkable, becauſe the *Stomach* is a Part more principally concerned in digeſting the Food. The *Inteſtines* are for ſeparating the *Chyle* and carrying off the *Fæces*. Yet we obſerve even in Animals, that live on the ſame ſort of Food, that their Stomachs are very different. One would therefore be more apt to think, that for digeſting the Variety of Food, and what is of a different Nature, that the *Organ* that is to perform it, ſhould be different too. Yet we find the *Stomachs* of Animals that live upon *Fleſh*, of others that live upon *Fruits*, and others that live upon *Graſs*, to be much alike; that 'twould be difficult to aſſign any Difference between them. If therefore we cannot make a Concluſion from the Structure of the *Stomach*, what *Food* is moſt natural to an Animal, much leſs one would think from the *Colon* or the *Cæcum*; thoſe Parts of the *Ductus Alimentalis* that are remote from the Stomach; and being ſo, ſeem rather as a *Cloaca*, for the Reception of the *Fæces*, than otherwiſe of any great Concern in digeſting the *Food*, or diſtributing the *Chyle*. Since *Man* therefore hath all manner of *Teeth*, fit for Preparation of all ſorts of *Food*, before it be convey'd to the *Stomach*; I ſhould rather think, that *Nature* did intend he ſhould live upon *all*; or at leaſt is ſo bountiful as not to deny him any, or ſtint him to one ſort only. So in like manner,

ner, ſince the *Organ* here in Man, is fitly adapted for digeſting all ſorts of Food, I ſhould rather incline to conclude, that therefore *Nature* intended all ſorts for him: Which *God Almighty* aſſures us he did, *Every moving thing that liveth ſhall be meat for you, even as the green Herb have I given you all things.* Gen. ix. 3.

But perhaps you may expect I ſhould give you ſome Inſtances in *Brutes*, where it doth not hold, that all *Carnivorous* Animals have no *Colon* or *Cæcum*, though, as to Man, the Caſe may be different. Now the * *Carigueya* or *Opoſſum* had a long *Colon*, though not *cellulated*, and a large *Cæcum*, that received all the *Fæces* as they paſs down; Yet this Animal feeds on *Poultry* and *Birds*. And I have a Male *Opoſſum* now by me, that feeds on nothing but *Fleſh*. On the other hand, the *Hedge-hog* or *Urchin*, that hath no *Colon* or *Cæcum*, and therefore by your Rule ſhould be *Carnivorous*, feeds on *Roots*, *Fruits*, *Herbs*, *&c.* and not on *Fleſh*. *Hogs* likewiſe, that have both a *Colon* or a *Cæcum*, will feed upon *Fleſh* greedily enough, when they can meet with it; though their ordinary Food be of another kind. And a *Rat* and *Mouſe* that have a large *Cæcum*, but no *Colon*, feed upon *Bacon*, as well as *Bread* and *Cheeſe*. If what † *Ælian* tells us can be relied upon, you have an Inſtance in the *Neat-kind* alſo. For he aſſures us, 'Αγελώτατοι δὲ ἄρα ἦσαν τῶν ζώων οἱ τῶν Αἰθιόπων ταῦροι, ϗ καλούμενοι σαρκοφάγοι. So * likewiſe he mentions *Horſes* and *Sheep* that feed upon *Fiſh*. But theſe Stories I ſuppoſe he hath taken from the *Indian Hiſtorians*; whoſe Credit I have ſufficiently examined; and ſhall therefore lay no Streſs upon them. Your *Obſervation* therefore as to *Brutes*, though it may hold for the moſt part true, yet it is not univerſal. And, as all other Rules, may have ſome Exception.

* Phil. Tranſ. *n.* 239. *p.* 105. Abr. Vol. II. *p.* 887.

† *Hiſt. Anim. lib.* 17. *cap.* 45. *ib. cap.* 25.

* *Diſcourſe concerning the* Pigmies *of the Ancients.*

A Reply, by Dr. Wallis, *ib. p.* 784.

3. I am inclined to think, That all Nations (as well before as ſince the Deluge) have uſed to *feed on Fleſh*. Which is a ſtrong Preſumption (as you well obſerve) that to feed on Fleſh *(duly prepared)* is not wholly *Unnatural* for Mankind. On the other hand; I believe you think (as I do) that *Raw Fleſh* is not a *Natural Food* for our Bodies. I do not know that any Nation have (of Choice) uſed to feed on *Raw Fleſh*; unleſs in Caſes of *Extremity*, or when they have not the Convenience of *Preparing* it by previous *Coction*, or ſomewhat equivalent. (For I put a great Difference betwen *Raw Fleſh* (which is the common Food of what we call *Carnivorous Animals*,) and Fleſh *duly prepared* for our Food. If any there be that (of Choice) feed on *Raw Fleſh*, I look upon it as a Caſe *Anomalous*; like that of the *Lamb* mentioned by *Gaſſendus*; and the *Horſe* (you mention) that eats *Oyſters*. I may add, the *Rat* eating *Bacon*, for want of other Food, (which yet is not quite void of Coction; and the *Swine* ſometimes eating *Poultry*. Which latter, I do not take to be purely *Natural*; but rather the Effect of an *Appetite Depraved* by Cuſtom; becauſe much of the *Hog-Waſh* we give to *Swine*, ariſeth from the Coction of *Fleſh* for our own Uſe; which does inure the Swine (a Voracious Animal) to the *Taſte of Fleſh*, and makes it familiar to them. But Fleſh,

duly prepared for our Food, I look upon as a thing very different from *Raw Fleſh*, and which may be proper Food for Man; if (and ſo far as) it agrees with our *Health*: (which Caution is to be obſerved, as to other Food, as well as Fleſh.) And this I refer to the Care of the *Phyſician* and *Apothecary*, rather than the *Cook* and the *Confectioner*: For theſe do oft comply with the *Wantonneſs* of the *Palate*, rather than the *Health* of the Body. I leave it to you to conſider, from what *Reaſon*, and for what *Uſe*, the Paſſage of *Fleſh* through the *Ductus Alimentalis*, ſhould (ordinarily) be more *Quick*, and that of *Herbs* more *Slow*; (For that ſeems to be the Cauſe, the *Colon* making the Way *Longer*, and the Paſſage *Slower*;) and in what Degree it is ſo. I ſay *Ordinarily*; becauſe, in Caſe of *Cathartichs* (or what is equivalent) the Speed is quickened. And, again; When as Nature ſeems to have (originally) deſigned in Man a large *Cæcum*, as in ſome other Animals, (and which, if I miſtake not, is in the *Fœtus* larger in Proportion to the reſt of the Inteſtines, than in Perſons adult,) How it comes to paſs that it is now of little or no Uſe; but ſhrinks up into an *Appendicula Vermiformis*; Whether or no this may partly proceed from our feeding ſo much on *Fleſh*; which will not admit ſo great a *Remora*, as a large *Cæcum* may occaſion in other Animals.

Of the Number of Acres contained in England, *by Dr.* Grew, *n.* 330. *p.* 266.

VIII. The Excellent Sir *William Petty* reckons about twenty eight Millions of Acres in *England*: Others, twenty nine Millions; Others, a few more. But I humbly affirm, they have all been miſtaken in under-reckoning. And the Reaſon of their Miſtake ſeems to have been, their reckoning only by the Maps; that is by computed, and not by meaſured Miles; by which only the Number of Acres can be known. I have ſeen an Account of the Number of Acres in each County: Which Account, whether taken from Dooms-Day Book, or from any other Regiſtry, cannot be true. For though we have loſt ſome Land, yet there is a great deal more now gained, which in the Conqueror's time lay under Sea. Within 120 Years, very much has been recovered out of the Seas, and maintained by Banks, in the Marſhes and Fenns of *Eſſex*, *Kent*, and the Iſle of *Ely*. And in ſome Parts of *Lincolnſhire*, the Land has gained of the Sea, four Miles in a direct Line from Land to Sea, in Memory of Men now living. Nor is it the truer for having been taken from any other Record: For if the Numbers of Acres, according to the ſaid Account in each Shire, be put together, they exceed not thirty nine Millions and a Quarter: Which Number, though it comes much nearer to the Truth than any of the former, yet is a great deal ſhort of it. For however, according to vulgar Computation, *England*, or *South Britain*, is reckon'd in Length but 305 Miles; and in Breadth about 290 Miles: Nevertheleſs it appears by an exact Wheel-Meaſure, That from New *Haven*, in the *South* of *England*, to *London* are fifty ſix meaſured Miles; and from thence by a ſtrait Line continued to *Berwick* in the *North* are 339 of the ſame meaſured Miles; in all 395 meaſured Miles, the true Length of *England*. And again, that from the South

Foreland in the *Eaſt*, to the Lands-End in *Cornwall*, are about 367 Miles of the ſame Wheel-Meaſure, the true Breadth of *England*.

This being known, it is eaſy without any laborious and coſtly Survey, to know alſo how many Square Miles, and conſequently how many Acres are contained in *England*, or *Great Britain*; to wit, in the following manner.

Plate 17. Fig. 1.

If a Line be draw on a Chart of *England*, from the South Foreland in *Kent* to *Berwick*; and from the two Ends of this Line, two more Lines meeting at the Lands-End in *Cornwal*, they will make the Triangle A B C: Which Triangle, in that it excludeth as much more of the Land, as it includeth of the Sea, as may anſwer the ſmall Number of Miles obtained by the Curvity of the Roads; it may therefore be allow'd to be equal to the *Area* of *England* or *South Britain*. Next, if to the Triangle A B C, another ſimilar and equal Triangle B C D be added; both together make the Rhomboid A B D C. Which being divided at E F, maketh the Rhomboids A C E F, and B D E F, equal one to the other. One of which is therefore equal to the Triangle A B C. And the Rectangle A G H F, ſtanding upon the ſame Baſe, and between the ſame Parallel Lines with the Rhomboid A C E F, by the 35th of the 1ſt of *Euclid*, is equal to the ſaid A C E F: equal to the Triangle A B C: equal to the *Area* of *England*, or *South Britain*. Now the Length between *Berwick* and the South Foreland in *Kent*, being about five Miles more than between *Berwick* and New *Haven*, which is 395 Miles: Therefore the Line A B may be taken for 400 Miles; and ſo the Line A F for 200. And the Line A G being leſs by about ſeven Miles, than between the South Foreland in *Kent*, and the Lands-End in *Cornwall*, which is 367 Miles, the ſaid A G may be taken for 360 Miles. Therefore A G, 360, being multiply'd by A F, 200, produceth 72000 Square Miles: And 72000 being multiply'd by 640, the Number of Acres contained in one Square Mile, produceth forty ſix Millions and 80000, the Number of Acres contained in *England*, or *South Britain*.

Whence it appears, Firſt, that if the Province of *Holland* contains, as is computed, but one Million of Acres, then *England* is more, by a Fraction of 80000 Acres, than forty ſix times as big as *Holland*. Next, if in the Province of *Holland*, containing but one Million of Acres, are two Millions and 400 Thouſand Souls, or two Millions and four tenths, as they are ſaid to be; then *England*, which contains forty ſix Millions of Acres, to be proportionably populous, ſhould have twice forty ſix Millions of People, and four tenths of forty ſix; that is about 110 Millions.

But to allow room enough for Perſons of all Degrees under our *Britiſh* Monarchy, if *England* were half as populous as *Holland*, with only fifty five Millions, it were a good Proportion, and would be near five times our preſent Number: And about twenty two times as many, as in the Province of *Holland*. To people *England* in a competent time, with this Number; there are ſundry ways very practicable. By which, I have computed, the preſent Number may be doubled in twenty four or twenty five Years. And probably quadrupled in about thirty ſix Years.

Of the Subſiding of Part of a Hill near Clogher *in* Ireland, *communicated by the Biſhop of* Clogher, *n.* 337. *p.* 267. Plate 17. Fig. 2.

IX. Let *S. T.* repreſent Part of the Ridge of an Hill, gradually riſing from *S* to *T*, for near half a Mile; and *S. T. W. U.* the North Side of the Hill, with a Declivity from *S.* to *U.* and from *T.* to *W.* The Perpendicular Height at *X.* to the Plain of the Bottom at *Y.* 150 Feet, and the Slope Line or *Hypotenuſe X. Y.* 630 Feet. The Declivity pretty uniform from *X.* to *L.* and from *L.* to *Y.* conſiderably ſteeper: The Bank *A. E. F. D.* overgrown with ſhrubby Wood: All the Ground on the Side of the Hill being firm, green, and arable; of a mix'd Soil, Clay and Gravel, but more Clayey.

On *Tueſday* the 10th of *March*, 1712-13. in the Morning, the People obſerv'd a Crack in the Ground like a Furrow made with a Plough, going round from *A.* by *B. C.* to *D.* They imputed this to (what they call) a Thunderbolt; becauſe there had been Thunder and Lightning on *Monday* Night. But on *Tueſday* Evening an hideous dull Noiſe raiſed their Curioſity; and they obſerv'd that the whole Space *A. B. C. D.* containing about three *Iriſh* (i. e. 4¼ *Engliſh*) Acres, had been all Day in a gentle Motion: And the Noiſe continued all Night, occaſion'd by the rubbing of Buſhes, tearing of Roots, rending and tumbling of Earth. The Motion ceas'd on *Wedneſday* After-noon; when they ſaw the Buſhes on the Bank *E. F.* were remov'd, ſome ſtanding and ſome overthrown, to the plain Meadow *Y. y.* The green Ground above *E. F.* when it came to the Top of the ſteep Part at *E. F.* rent with hideous Chaſms, ten, fifteen or twenty Feet deep, and tumbled down in Rolls of a Yard or two thick, and ten or twenty long and broad; not unlike a ſmooth Water breaking over a Cataract, and tumbling in Waves below.

There was a Precipice at the Top *X. x.* ſixty five Feet perpendicular, making the Slope Line *X. x.* 126 Feet. The Ground from *x.* to *L.* was made more level, the whole perpendicular Height of *x.* not exceeding the Plain of *L.* above thirty Feet; but the Ground at *L.* in the whole Line from *E.* to *F.* was mounted above twenty Feet higher than the unmoved Ground on either Side at *E.* and *F.* and the Height of *L.* above the Plain of *y.* is fifty five Feet. There was a Ditch *H. I.* went croſs the Ground; which being broken off at *o. o.* is removed together with the moving Part thirty four Feet lower down than the immoveable; but at the Bottom *y.* it is tumbled ſixty Feet over the plain Meadow. The Breadth at the Bottom *a. b.* is 400 Feet, and at *c. d.* about 300. The whole Face of the Precipice *X. x.* is of a blue Clay, mix'd with many little blue Stones. The Metal is very hard when dry; but upon any Rain ſoftens to a kind of Mortar, without the Degree of Toughneſs and Stiffneſs that is natural to Clays. It is very much like that Gravel or Sand (as they call it) which is ſomewhat of a grey marly Nature, and with which of late they ſo much improve the plow'd Land in this Country.

About *x*. there are Chaſms or Gapings full of Water, which make a Rill down the *Hiatus B. E. A.* but in no greater quantity than might have been expected from a Well ſunk to a leſs depth. Though I was told that there were Holes in the higher Mountains, that received Water under-ground; yet I can find no ſuch thing, nor any Symptoms of a Current under-ground, either where it enters or riſes, in all the neighbouring Ground for ſome Miles. It ſeems to me that there has been no Vacuity under-ground to receive the ſubſiding Earth; for what the Bank *E. L. F.* is raiſed higher, and what is tumbled down to the plain *a. b.* may very well compenſate the Subſiding at the Precipice *X. x.*

Before the Rupture the Declivity from *X.* to *L.* was not altogether uniform, but was hollower where *x.* is now, than the adjacent Parts: It might have been, by the Deſcription I have from the People, ten Feet deep in the middle, and one hundred Feet diameter; and they have a Tradition, that this was made by a Subſiding before the Forty One Wars, (the oldeſt *Epocha* the Country *Iriſh* know.) The Neighbours impute it to the great and conſtant Rains we have had laſt Harveſt and Winter, which have ſoak'd and ſteep'd all the Ground.

An uncommon ſinking of the Earth, near Folkeſtone *in* Kent, *by Mr.* Sackette. *n.* 349. *p.* 469. *Plate* 17. *Fig.* 3.

X. The Figure deſcribes a ſtrait Road from what we call the *Mooring-Rock*, to *Tarlingham-Houſe*; the manner of the Country as to the Riſing and Falling, being much the ſame, for about a Mile on either hand of the Road deſcribed.

A. The *Mooring-Rock*, about half-way between high and low Water-mark. *B.* The Foot of the Cliff, fifty Yards from the Rock. *C.* The Top of the Cliff, about ſix Yards high. *C D.* A Plain of fifty Yards. *D E.* A cragged Cliff, of ſixty Yards high. *E F.* A Plain above a Mile long. *F G.* An Hill of ſteep Aſcent, near half a Mile. *G H.* The Land from the Top of the Hill to the Houſe, near a Mile. *I. Tarlingham-Houſe*, lying near two Miles and an half *N. N. W.* from the Rock. *E G H.* A Line of Sight. *K B L.* The Shore at High Water-mark.

The *Mooring-Rock* (tho' it lies ſurrounded with great Numbers of other Rocks) is it ſelf a moſt noted one, known by this Name, time out of mind. At this Veſſels uſe to be moored, while they are loading other Rocks; which they take from hence, not only for our own *Pier-Heads*, but for thoſe of *Dover-Pier*; and a very great Quantity of them were ſhip'd, in the Time of *Oliver*'s Uſurpation, and carried to *Dunkirk*, for the Service of that Harbour. The Rock has remain'd fix'd thus, for the Memory of Man; and old Men have obſerved, that, for forty Years and upwards, the diſtance between it and the Foot of the leſſer Cliff *A B.* has been much the ſame; neither can they be much out in their Gueſs, the Diſtance being ſo ſmall. Tho' there ſeems nothing extraordinary in this, yet its what they take ſpecial Notice of, to their great ſurprize: for they ſay, and prove by good Marks and Tokens, that the leſſer Cliff *B C.* has been conſtantly falling in, inſomuch, that from time to time, in their Memory, near ten Rods forward to the Land has been carried away by the Sea. From whence, as it appears, that the Plain between the Top of the leſſer Cliff and the Foot of the higher *C D.* has been formerly double the Breadth that it is at preſent, ſo the diſtance between the Rock and the Foot of the leſſer and lower Cliff *A B.* ſhould have increaſed in proportion, and would have been double at preſent, to what it has been formerly: But this Diſtance remaining the ſame (as is above noted) or rather leſs (in the Opinion of many) is what is greatly wonder'd at: nor can it be accounted for otherwiſe, than by ſuppoſing that the Land preſſing forward into the Sea is waſhed away by the high Tides; and, as often as this happens, preſſes forward again. This preſſing forward of the Land into the Sea, would be incredible, were it not ſhewn to be matter of Fact; and that not only at this one place of Obſervation, but by like Obſervations all along this Coaſt, as far as the Situation continues the ſame.

Now, let us climb both theſe cragged Cliffs, and place our ſelves at the top of the higher one, at the Point *E.* And here we are to obſerve, that (as old Men inform us) upward of forty Years ago, not ſo much as the Top of *Tarlingham-Houſe* could be diſcern'd, neither from hence, nor yet a good diſtance off at the Sea; but it diſcovered it ſelf by degrees, till at this Day, not only the whole Houſe, but a great Tract of Land below it, is plainly to be ſeen, as in the Line of Sight *E G H.* The Tract of Land is more in proportion than deſcrib'd in the Sketch, between the Point at *H* and the Houſe. In this there can be no Fallacy; and we can aſcribe it to nothing leſs than the ſinking of the Hills (for their Tops could never wear away conſiderably, being always cover'd with Graſs, and never broken up by the Plough or otherwiſe). Theſe Hills are all of Chalk, and have probably very large Caverns within, Springs of Water always flowing plentifully from the Foot of them; and I have had it obſerv'd to me, that upon their Tops frequent Cracks have been taken notice of. Whatever be the Cauſe of it, 'tis not to be doubted but that theſe Hills are greatly ſunk. And this ſinking of the Hills, the People at this Place believe, forces the Cliffs and all the Land forward into the Sea. The Cliffs conſiſt of great ragged Sand-Stones till we come to near a Yard (at ſome places more) of the Bottom; then we meet with what they call a Slipe, *i. e.* a ſlippery ſort of Clay always wet. Upon this Slipe at the Bottom, they preſume that the hard ſtony Land above ſlides forwards toward the Sea, as a Ship is launch'd upon tallow'd Planks. This Relation is atteſted under the Hands of ſeveral ancient and credible Perſons.

Of the Antiquity of the Venereal Diſeaſe, by Mr. Will. Beckett. *n.* 357. *p.* 839.

XI. By ſearching into our own Antiquities, we may be furniſh'd with Inſtances of the Frequency of this Diſtemper among us, in all its reſpective Stages, before ever our modern Authors dream it had its Appearance in *Europe.* I ſhall begin with the firſt Degree of this Diſeaſe, and prove from authentick Evidences, it was anciently call'd the **Brenning** or

Burning; and that this Word has been ſucceſſively continu'd for many Hundreds of Years, to ſignify the ſame Diſeaſe we now call a *Clap*; and that it was not diſcontinu'd till that Appellation firſt began to have its Riſe. The moſt likely Method to accompliſh my Deſign, will be firſt to examine thoſe Records that relate to the *Stews*, which were by Authority allowed to be kept on the *Bank-Side* in *Southwark*, under the Juriſdiction of the Biſhop of *Wincheſter*, and which were ſuppreſſed the 37th of *Henry* VIII. For its impoſſible, but if there were any ſuch Diſtemper in being at that Time, it muſt be pretty common among thoſe lewd Women who had a Licence for entertaining their Paramours, notwithſtanding any Rules or Orders which might be eſtabliſh'd to prevent its Increaſe: But if we ſhall find that there were Orders eſtabliſh'd to prevent the Spreading of ſuch a Diſeaſe, that Perſons might be ſecure from any contagious Malady after their Entertainment at thoſe Houſes (which were anciently eighteen in Number, but in the Reign of *Henry* VII. reduced to twelve) we may then ſecurely depend upon it, that it was the Frequency of the Diſeaſe that put thoſe that had the Authority, under a neceſſity of making ſuch Rules and Orders. For the ſame Powers that granted a Liberty for keeping open ſuch lewd Houſes, muſt find it their Intereſt to ſecure, as much as poſſible, all Perſons from receiving any Injury there; leſt the Frequency of ſuch Misfortunes ſhould deter others from frequenting them, and ſo the original Deſign of their Inſtitution ceaſe; from the entire ſinking of the Revenues. Now I find that, as early as the Year 1162, divers Conſtitutions relating to the Lordſhip of *Wincheſter*, (being alſo confirmed by the King) were to be kept for ever, according to the old Cuſtoms that had been time out of mind. Among which theſe were ſome, *viz.* No *Stew holder* to take more for a Woman's Chamber in the Week than 14*d.* Not to keep open his Doors upon Holy Days. No ſingle Woman to be kept againſt her Will, that would leave her Sin. No ſingle Woman to take Money to lie with any Man, except ſhe lie with him all Night till the Morning. No Stew-holder to keep any Woman that hath the perilous Infirmity of **Burning**. Theſe and many more Orders were to be ſtrictly obſerved, or the Offenders to be ſeverely puniſhed. Now we are aſſured there is no other Diſeaſe that can be communicated by carnal Converſation with Women, but that which is Venereal, by reaſon that only is contagious; and its evident the **Burning** was certainly ſo: For, had it been nothing elſe but ſome ſimple Ulceration, Heat, or Inflammation, there would have been no Contagion; and that affecting only the Woman, could not be communicated by any Venereal Congreſs, and ſo not infer a Neceſſity of her being comprehended under the reſtraining Article. Theſe Orders likewiſe prove the Diſeaſe was much more ancient than the Date abovementioned; becauſe they were only a Renewal ſuch as had been before eſtabliſhed time of mind.

But to confirm this farther, I find that in the Cuſtody of the Biſhop of *Wincheſter*, whoſe Palace was ſituated on the *Bank-Side* near the *Stews*, was a Book written upon Vellum, the Title of which runs thus; **Here begynne the Ordinances, Rules, and Cuſtumes, as well for the Salvation of Mannes Lif, as for to aſchew many Myſchiefs and Inconvenients that dayley be lik there for to fall owte to be rightfully kept, and due Execution of them to be don unto any Perſonne wythin the ſame.** One of theſe Articles begins thus; *De his qui cuſtodiunt Mulieres habentes Nephandam infirmitatem.* It goes on, *Item*, **That no Stew-holder keep noo Woman wythin his Hous that hath any Sickneſſe of** BRENNING, **but that ſhe be putte out upon the peyne of make it a fyne unto the Lord of a hundred Shylings.** This is taken from the original Manuſcript which was preſerv'd in the Biſhop's Court, ſuppos'd to be written about the Year 1430. From theſe Orders we may obſerve the Frequency of the Diſtemper at that Time; which, with other Inconveniences, was **dayley lik there for to fall owte**: and the Greatneſs of the Penalty, as the Value of Money then was, that is laid on it, proves it was no trifling or inſignificant thing.

But the bare Proof of there having been anciently ſuch a Diſeaſe as was called the **Burning**, may be thought to be inſufficient, unleſs we were perfectly aſſured what it was, and how it was in thoſe Times deſcribed: I ſhall therefore do it from an unqueſtionable Authority, which is that of *John Arden*, Eſq; who was one of the Surgeons to our King *Richard* II. and likewiſe to King *Henry* IV. In a curious Manuſcript of his upon Vellum, he defines it to be, a certain inward Heat and Excoriation of the *Urethra*; which Deſcription gives us a perfect Idea of what we now call a *Clap*; for frequent Diſſections of thoſe that laboured under that Diſeaſe, have made it evident, that their *Urethra* is excoriated by the Virulency of the Matter they receive from the infected Woman; and this Excoriation or Ulceration is not confined to the *Oſtiola* or Mouths of the *Glandulæ Muſcoſæ*, as has been lately thought, but may equally alike attack any part of the *Urethra* not beyond the reach of the impelled malignant Matter. The Heat before deſcribed, which theſe Perſons are ſenſible of, as well now as formerly, is a conſequent of the excoriated *Urethra*; for the Salts contained in the Urine muſt neceſſarily prick and irritate the nervous *Fibrillæ*, and excite a Heat in thoſe Parts of the *Urethra* which are diveſted of its natural Membrane; which Heat will always be obſerved to be more or leſs, as the Salts are diluted with a greater or leſs Quantity of Urine; a thing I have often obſerved in Perſons that have laboured under this Infirmity in hot Weather, when the perſpirable Matter being thrown off in greater Quantities, the Salts bear a greater Proportion to the Quantity of Urine, and thereby make its Diſcharge at that Time ſo much the more painful and troubleſome.

Thus we ſee this very early and plain Deſcription of this Diſeaſe among us, to be entirely conformable to the lateſt and moſt exact anatomical Diſcoveries. Here is no Tone of the *Teſticles* depraved, according to *Trajanus Petronius*; no Exulceration of the *Paraſtatæ*, according to *Rondeletius*; no Ulceration of the *Seminal Veſſels*, according to *Platerus*; no Seat of the Diſeaſe in the *Veſiculæ Seminales* or *Proſtatæ*, according to *Bartholin*; nor in thoſe Parts and the Teſticles at the ſame time, according to our Countryman *Wharton* and others, who have falſly fixed the Seat of this Diſeaſe, and whoſe Notions, in this reſpect, are now juſtly exploded; but a ſingle and true Deſcription of it, and its Situation, about an hundred and fifty Years before any of thoſe Gentlemen wrote.

Having, I hope, ſufficiently made it appear the **Burning** was a Diſeaſe very early among us, and given the Deſcription of it, I ſhall proceed to ſay ſomething of the ancient Method that was made uſe of to cure it. We are not to expect the Meaſures of our Predeceſſors, in thoſe early Times made uſe of, ſhould be calculated for the removing any Malignity in the Maſs of Blood, or other Juices, according to the Practice in Venereal Caſes at this time; becauſe they looked upon the Diſeaſe to be entirely local, and the Whole of the Cure to depend upon the Removal of the Symptoms: Hence 'twas they recommended ſuch Remedies as were accommodated to the taking off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*. The Proceſs for the accompliſhing of this, I ſhall ſet down from the before-mentioned *John Arden*, who wrote about the Year 1380. his Words are as follow, *Contra Incendium. Item contra incendium Virgæ Virilis interius ex calore & excoriatione, fiat talis Syringa* (i. e. *injectio*) *lenitiva. Accipe Lac mulieris maſculum nutrientis, & parum zucarium, Oleum violæ & ptiſanæ, quibus commixtis per Syringam infundatur, & ſi prædictis admiſcueris lac Amygdalarum melior erit medicina.* There is no doubt but this Remedy, being uſed to our Patients at this time, would infallibly take off the inward Heat of the Part, and cure the Excoriations or Ulcerations of the *Urethra*, by which means what iſſued from thence would be entirely ſtopt; and this was all they expected from their Medicines, foraſmuch as they were entirely unacquainted with the Nature of the Diſtemper; and did not in the leaſt imagine, but if the Symptoms that firſt attack'd the Part were removed, the Patient was entirely cured.

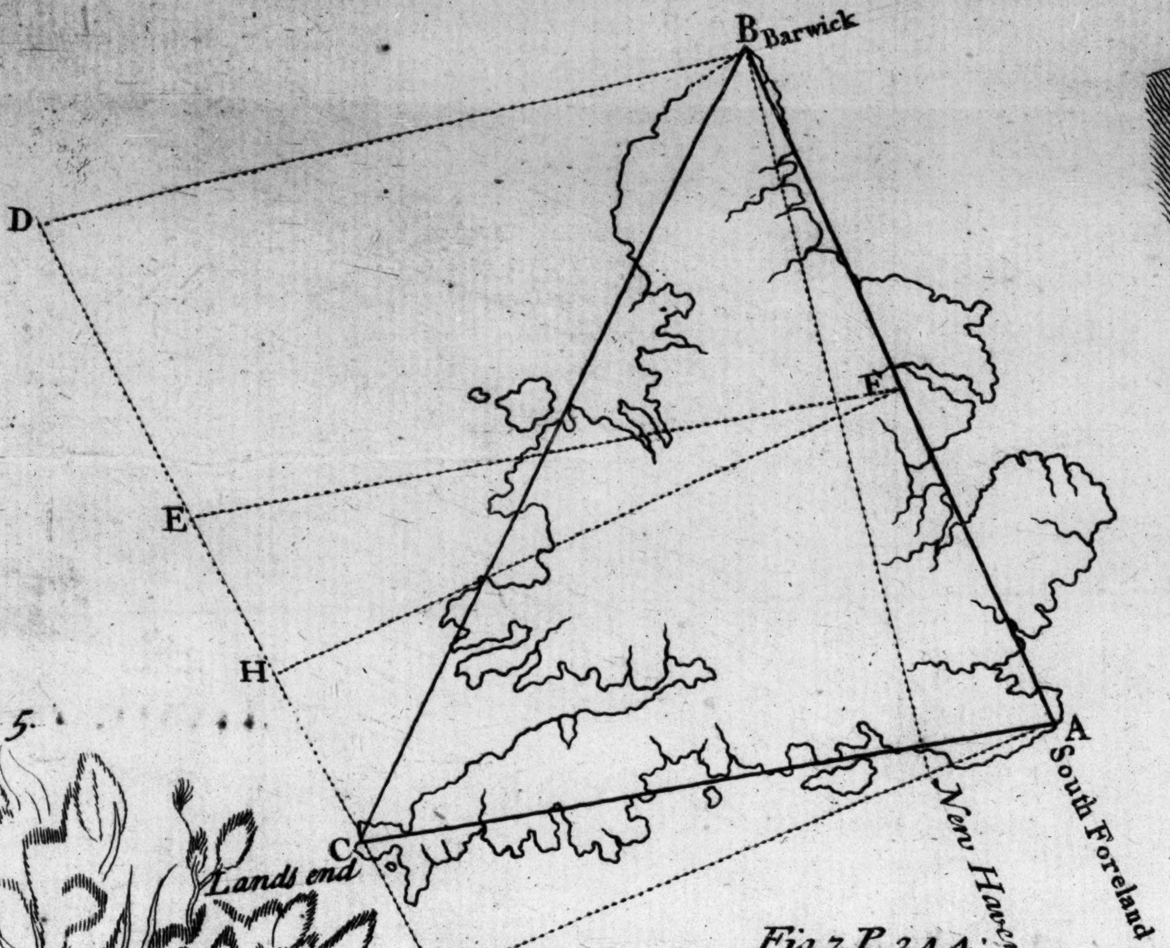
I ſhall now prove, that by this **Brenning** or **Burning** is meant the Venereal Diſeaſe, by demonſtrating that ſucceeding Hiſtorians, Phyſical and Chirurgical Writers, and others, have all along with us in *England* uſed the very ſame Word to ſignify the Venereal Malady. In an old Manuſcript I have by me, written about the Year 1390. is a Receipt for **Brenning of the Pyntyl, yat men clepe ye Apegalle; Galle** being an old *Engliſh* Word for a running Sore. They who know the *Etymology* of the Word *Apron*, cannot be ignorant of this. And in another Manuſcript, written about fifty Years after, is a Receipt for **Burning** in that Part by a Woman. *Simon Fiſh*, a zealous Promoter of the Reformation in the Reign of *Hen.* VIII. in his Supplication of Beggars, preſented to the King in 1530. ſays as follows, *Theſe be they* (ſpeaking of the *Romiſh Prieſts*) *that corrupt the whole Generation of Mankind in your Realm, that catch the Pocks of one Woman and bear them to another; that be* **Burnt** *with one Woman and bare it to another; that catch the Lepry of one Woman and bare it unto another.* But to make this Matter ſtill more evident, I am to obſerve, that * *Andrew Boord*, a Doctor in Phyſick, and *Romiſh* Prieſt, in the Reign of *Hen.* VIII. ſpeaks very particularly of this ſort of Burning; one of his Chapters beginneth thus, **The 19th Chapter doth ſhew of** BURNING **of an Harlotte**; where his Notion of communicating the *Burning* is very particular. The ſame Author adds, that if a Man be **Burnt** with an *Harlot*, and do meddle with another Woman within a Day, he ſhall **Burn** the Woman that he ſhall meddle withal; and as an immediate Remedy againſt the **Burning,** he recommends the waſhing the *Pudenda* two or three times with White Wine, or elſe with Sack and Water; but if the Matter have continued long, to go to an expert Chirurgeon to have Help. In his 82d Chapter, he ſpeaks of two ſorts of Burning, the One by Fire, and the Other by a Woman through carnal Copulation, and refers the Perſon that is **Burnt** of a *Harlot* to another Chapter of his for Advice, what to do, **yf he get a Dorſer or two,** ſo called from its Protuberancy or bunching out: For I find about that time the Word *Bubo* was moſtly made uſe of, to ſignify that ſort of Swelling which uſually happens in peſtilential Diſeaſes. From hence it appears, the *Burning*, by its Conſequents, was *venereal*, ſince every Day's Experience makes it evident, that the ill Treatment of the firſt Symptoms of the Diſeaſe, either by aſtringent Medicines, or the removing them by cooling and healing the excoriated Parts, will generally be attended with ſuch Swellings in the Groin, which we rarely obſerve to happen from any other Cauſe whatſoever.

I ſhall give a few more Inſtances of this Diſeaſe being call'd the *Burning*, and conclude. In a Manuſcript I have of the Vocation of *John Bale* to the Biſhoprick of *Oſſory* in *Ireland*, written by himſelf, he ſpeaks of Dr. *Hugh Weſton* (who was Dean of *Windſor* in 1556. but deprived by Cardinal *Pole* for Adultery) as follows, "At this Day is lecherous *Weſton*, "who is more practiſed in the Art of **Brech Burning** than all the "*Whores* of the *Stews*. And again, ſpeaking of the ſame Perſon, he ſays, "He not long ago **brent** a *Beggar* in St. *Botolph*'s Pariſh." The ſame Author ſays of him elſewhere, "He had been ſore bitten with a "*Wincheſter-Gooſe*, and was not yet healed thereof;" which was a common Phraſe for the Pox at that time, becauſe the *Stews* were under the Juriſdiction of the Biſhop of *Wincheſter*. *Mich. Wood* in his Epiſtle before *Steph. Gardiner*'s Oration *De vera obedientia*, printed at *Rhoan* in 1553. gives another Evidence of the **Burning**. And in 1562. *William Boylen*, bringing in *Sickneſs* demanding of *Health*, what he ſhould do with a Diſeaſe call'd the *French Poches*. *Health* anſwers, that he would not that any ſhould fiſhe for this Diſeaſe, to be bold when he is bitten, to thynke thereby

* *The Breviary of Health, printed in* 1546.

Plate XVII. Part IV. P. 250.

Fig. 1.


B Barwick
D
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A South Foreland
New Haven
C Lands end
G

Fig. 2.

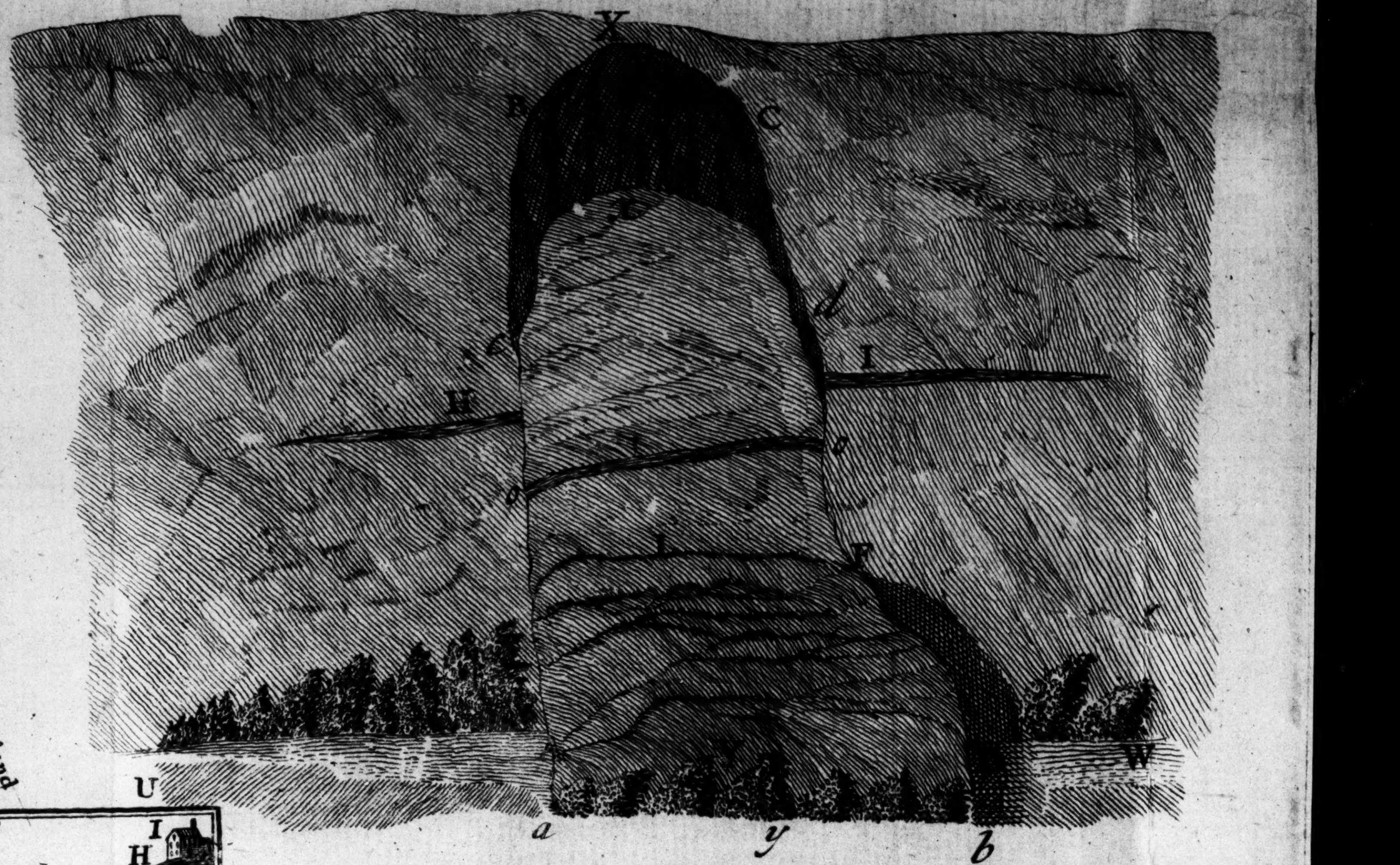
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Fig. 5.

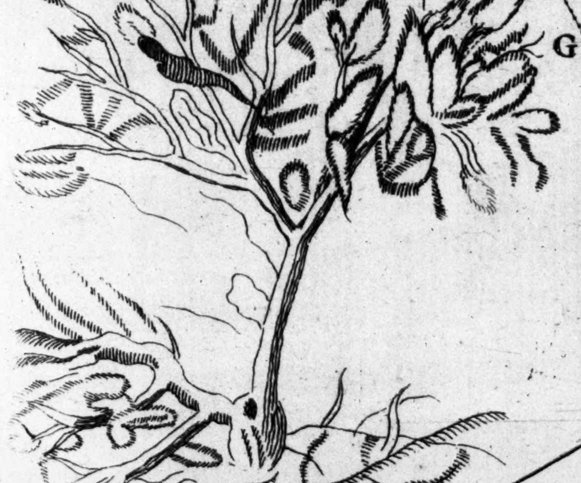

Fig. 3. P. 244.

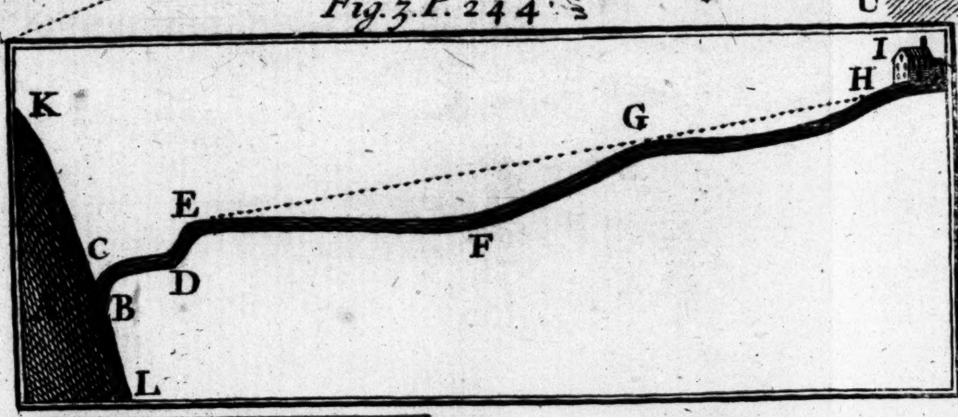
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Fig. 3. P. 250.

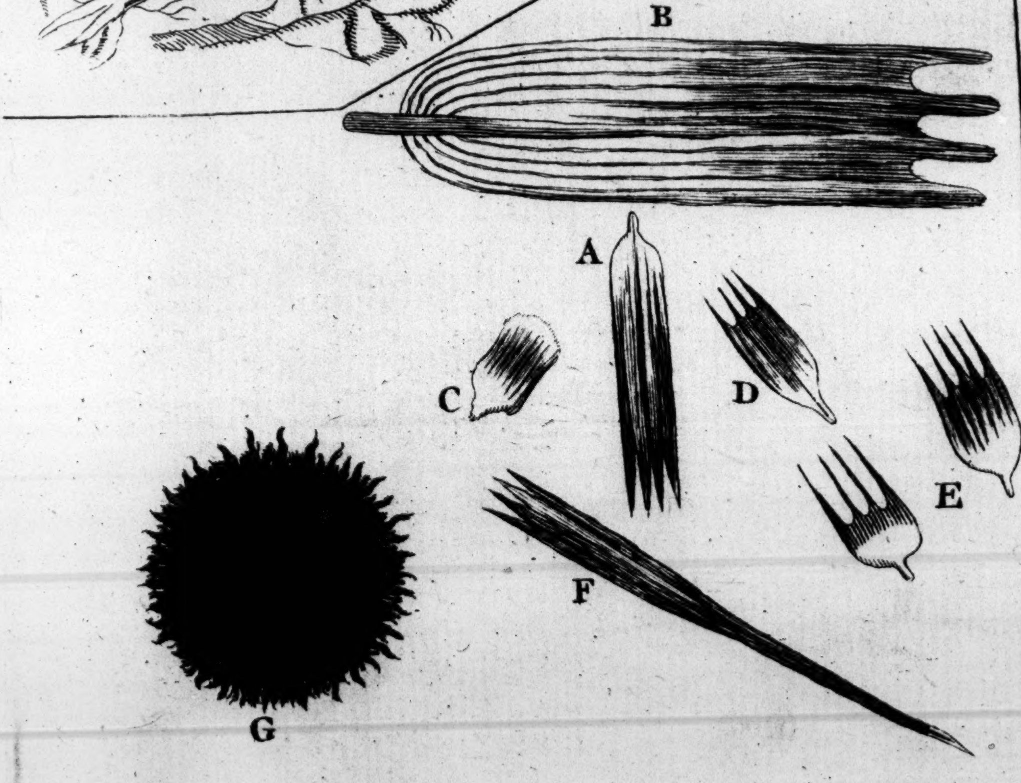

Fig. 4. 250. P.

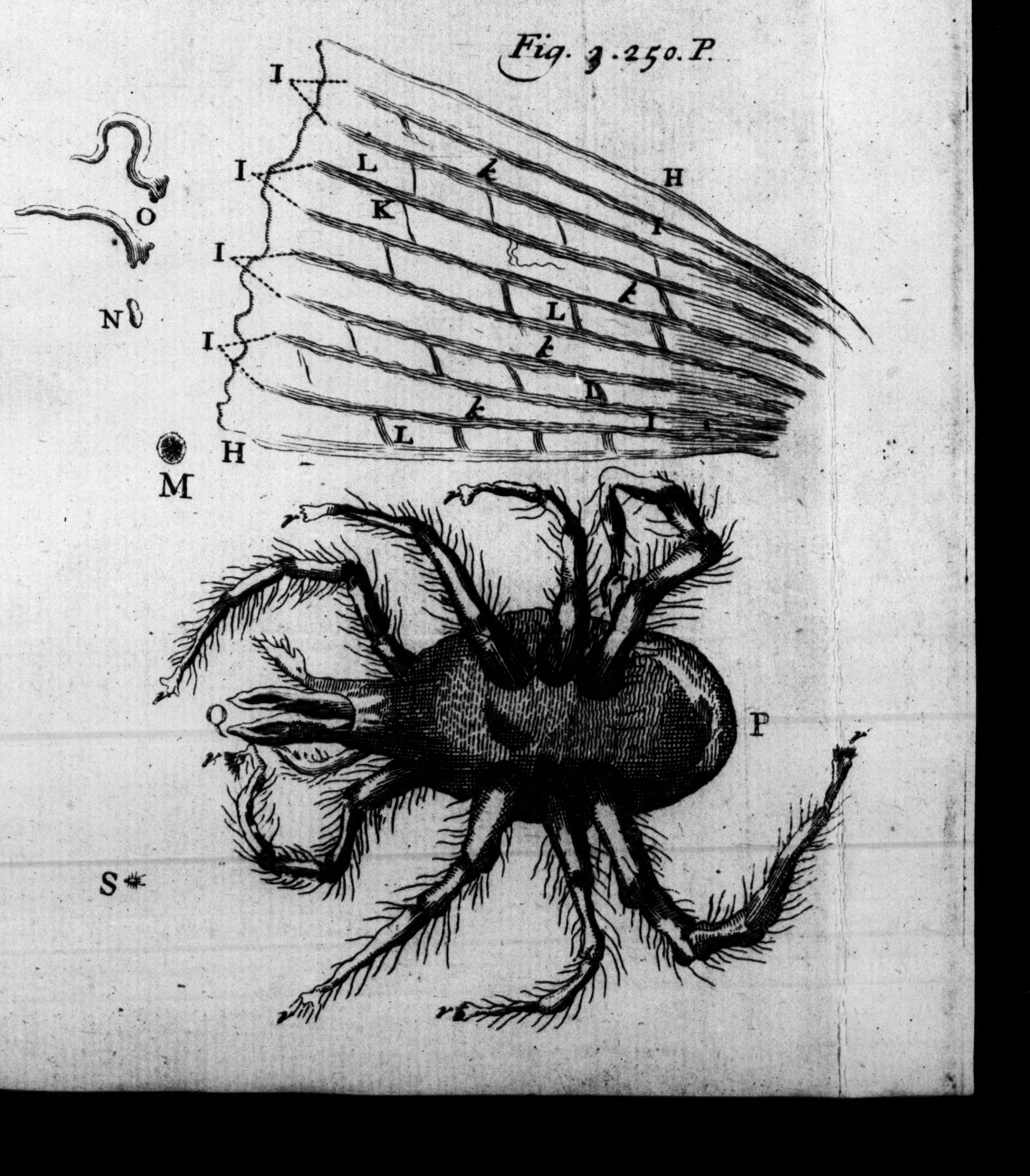
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Plate XVIII. Part IV. P. 251.

Fig. A.

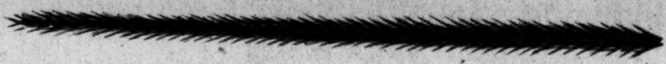


Fig. E.

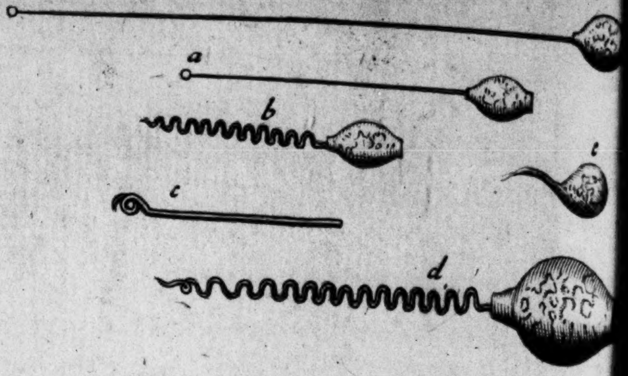


Fig. B.

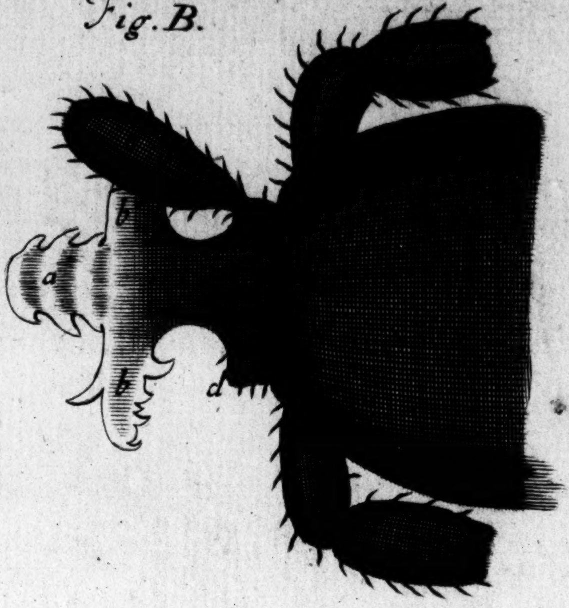


Fig. F.

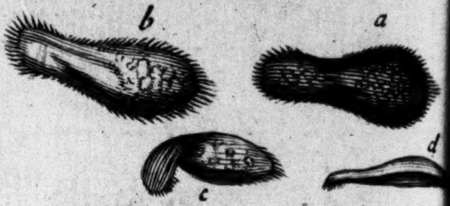


Fig. H

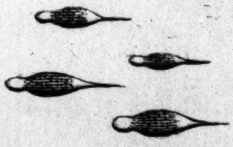
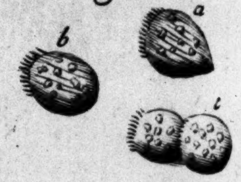
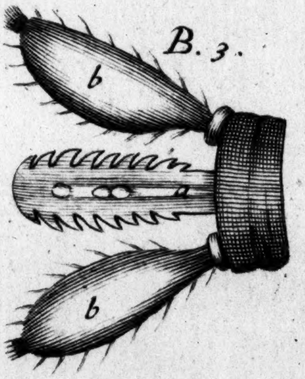


Fig. G.



B. 3.



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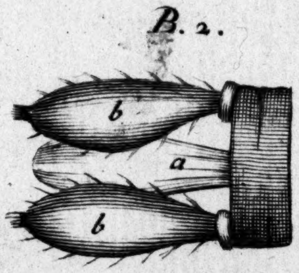


Fig. L.

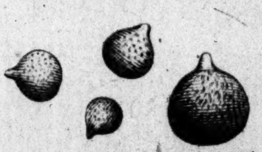


Fig. K.

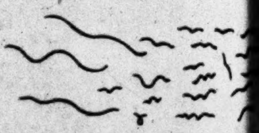


Fig. M.

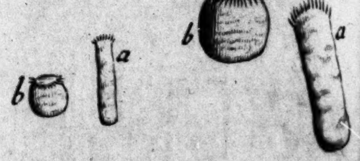


Fig. C.

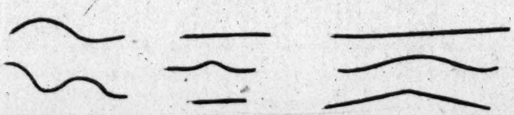


Fig. N.

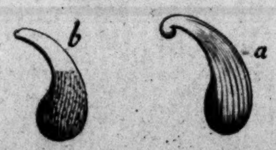
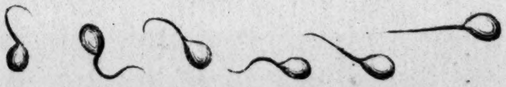


Fig. D.



part of the briſtle, but I cannot expreſs the beauty and regularity of it, and every briſtle on the whole Body and Legs, both long and ſhort, had the ſame formation. But I muſt tell you withal, that all Mites are not ſo, for of 7 or 8 incloſed together, I ſound but one whoſe briſtles were of this make, in the reſt the horns only were ſpicated. Whether they were of different kinds, or rather only of different Sexes, I ſhall not determine, they were all taken out of the ſame Cheeſe at the ſame time, and were in other parts very like. Their Mouths open Horizontally (to the right and left) like that of a Waſp, and hard headed Maggot, and after their being ſome days ſhut up together I found ſome dead, and the Survivors preying on them, which gave me an opportunity of obſerving their manner of feeding, which was very remarkable, for they thruſt one mandible forward, and bring the other backward at the ſame time, and this alternately, and by that means ſeems to grind their food. If you ſhould bring one of the greateſt Magnifiers to obſerve a Mite or the like minute Animal, you muſt lay him on a thin Muſcovy-Plate in one of the Sliders, and cover him with a Concave, and take good care not to cruſh the Object between the Plates in your approach.

2. I pull'd off an handful of *Muſcles*, which ſtuck on a piece of a Rock that was covered by the Sea every Tide. Theſe I brought with me that I might obſerve the Organs by which they fix themſelves ſo firmly to a Stone, that even a Storm will not waſh them off. I found that theſe were threads which came from that part which is called the Beard of the Muſcle, which had on their extremity, a flat ſpungy ſubſtance, that adhered only by impoſition, like the wet pieces of Leather which Boys faſten to Stones, and they are deſcrib'd, and well pictured by Mr. *Leeuwenhoeck*. But my principal end in gathering theſe Muſcles was, that I might view and examine the Inhabitants of thoſe little white Shells, which ſtick like Puſtules on Muſcle-ſhells, (as they do likewiſe on Lobſters, Oyſters, Stones, *&c.*) Mr. *L's* Draught is very accurate, only that in the 12 long Branches growing from the Head, the briſtles are there pictured coming out quite round on each joynt of every Branch, whereas they grow only on the inſide, (all the hind part being perfectly bare) and look not unlike a ruffled Feather ſtript on one ſide. I cannot gueſs at the uſe of theſe curious ramifications, unleſs they ſerve to draw in food to the Creature, which cannot move out of its place. For keeping them alive in Sea-water, I ſaw them often put them out thro' the ſlit of the *Operculum* which cloſes the top of the Shell, and draw them in again. This as I remember the Naturaliſts call a *Balanus* and claſs it with the *Concha Anatifera*. I never ſaw the latter, but that being much larger, if (as 'tis probable) it has the like Organs, we may eaſily account for the miſtake of even ſome obſerving Men, who affirm they have ſeen them Feathered, and think them Birds *in fieri*. Some of the Muſcles which I brought were little above a quarter of an Inch long. I took one of theſe out of the Shell, and expoſed it to the Microſcope on a thin Plate of Muſcovy Glaſs, and holding it to

the light of a Candle, I ſaw in the thinner parts a vaſt number of Veins and Arteries, and the Blood circulating in them more diſtinctly than I ever ſaw it in any other Animal. For I had this advantage in the Obſervation, that the Object lay always quiet, without changing Place, and my Plate was ſo thin, that I could bring to it what Magnifiers I pleaſed, and look without diſturbance as long as I pleaſed; for whereas other Animals will not eaſily be brought to lye ſtill any conſiderable time, and will not live long when expoſed to a Microſcope, this lay always in the poſture it was placed, and the motion of the Blood continued with little alteration 6 or 7 hours, only by keeping the Object moiſtened with Sea-water, and might have laſted much longer if I had not thrown it away. I repeated the ſame Experiment for 2 or 3 days with ſome of the remaining Muſcles, with little difference in the Succeſs.

The other day I ſpyed running among ſome Fruit, a ſmall Worm which I could perceive to have a multitude of Legs, it was not half an Inch long, and the Body not thicker than an Hog's Briſtle. This I put alive into a ſmall Tube, and found it a perfect *Scolopendra*, whoſe Body was made up of 60 Inciſures, at every one of which was a pair of Legs (one on each ſide) and each Leg had five Articulations. On his Head were 2 Horns, each of 16 Joints, and under it a pair of terrible Forcipes, red, crooked, and pointed like the Talons of an Hawk, and I often ſaw him open and ſhut them, and wipe his Horns thro' them. Theſe Forcipes are not unlike, and probably for the ſame Uſe as thoſe on the Head of a Spider, but they are difficultly ſeen (becauſe generally kept cloſe) in a living Spider, but you may readily find them open'd, and in their perfect Shape, in the Spider's *Exuviæ*, or caſt Coats.

I found a ſmall black flat *Tick*, (after walking in a Thicket) ſticking on my Arm, and it had got its forepart ſo far into the Skin, that I had much ado to ſeparate it with the point of a Needle, ſo as to preſerve it intire and unhurt. I obſerved the Snout of this to be ſhaped not very unlike the jagged *Proboſcis* of the *Serra Piſcis*. The forepart of it *a* being like the end of a broad-pointed Sword, is clear and tranſparent, and has 3 Teeth on each edge, below which there comes out another ſerrated part *b b* on each ſide almoſt at right Angles; but this is partly hid (when you look on the Back) by a thick Horn *c* on the ſide of the Head. I broke off one of the Horns at *d*, and then it appeared as in the annexed Figure, which repreſents the fore part of this *Tick*. I afterward examin'd the Snouts or Proboſcis of *Dog Ticks*, to ſee if they had the like Conformation, and found their Appearance as in *Fig.* B 2. the Snout *a* being ſo covered by the two clumſy thick Horns *b b* that the ſerrated Edges could not be perceived, but ſeparating the Horns (with ſome difficulty) they appeared in the Poſture of *Fig.* B 3. and I could then plainly ſee 8 Teeth or Jaggs on each ſide, as here expreſſed, but the Snout of a *Dog Tick* has not the additional ſerrated part, which is in the *Wood Tick*. I could alſo perceive a Pipe

Fig. B.

a Pipe or Channel run through the Snout, and ſee ſome Bubbles move up and down in it, which I have alſo endeavoured to repreſent.

3. I have found ſome of the *Animalcula* in Pepper Water, almoſt incredibly minute, which appear even to my greateſt Magnifiers not ſo large as a Mite to a naked Eye, and in the bigger ſort, I can plainly ſee the little Feet by which they perform ſo briſk Motions, which I never could find before. But I doubt not but your own Microſcopes had ſhew'd you what is diſcoverable in theſe Liquors, and therefore I ſhall ſay no more of them. Only I cannot omit mentioning one ſort of Animal in them, which I never diſcover'd till within theſe 3 or 4 days. Theſe are very ſlender long Worms, of which my Pepper-water is prodigiouſly full. They are all of the ſame thickneſs, but their lengths are very different, ſome being twice, and ſome thrice as long as others, and at a Medium I judge the Proportion of their length to their breadth at leaſt as 50 to 1. Even to the largeſt Magnifiers they look like Shreds of Horſe-hair (to a naked Eye) from a quarter to 3 quarters of an Inch long. Upon a modeſt Eſtimate their thickneſs is not the 100th part of an hairs breadth, and conſequently if you imagine an hair of your Head ſplit into above 7800 equal Fibres, each Fibre would be as thick as one of theſe Creatures. Their Motion is equable and ſlow, and generally they wave their Bodies but little in their Progreſſion, tho' ſometimes they make greater Undulations. But what is more remarkable, they ſwim with the ſame Facility both backward and forward, ſo that I cannot diſtinguiſh at which end the Head is, and I have ſeen the ſame Worm go forward with one end, and back again with the other end foremoſt above 20 times together. And ſometimes they will (like Leeches) fix one end on the glaſs plate (on which I lay the Water) and move the looſe part of their Body round about very oddly. Theſe I take leave to call *Capillary Eels*, and I have given you as well as I could a repreſentation of their Appearance to a great Magnifier, in the ſeveral Poſtures I have ſeen them ſwim. I find the Duſt of the *Fungus Pulverulentus* or *Puff-Ball* to be the minuteſt Powder that I ever ſaw: To a naked Eye you know (when 'tis cruſh'd) it appears like a Smoke or Vapour, and with a common Microſcope you cannot diſtinguiſh the Particles. But when 'tis viewed with the greateſt magnifiers, each grain is viſible and exactly alike, and appears a perfect ſpherule of an Orange colour, ſomething tranſparent, whoſe axis is not above the 50th part of the Diameter of an Hair. So that a Cubical Veſſel of an Hairs breadth of a ſide, would hold 125000 of them. This was the duſt of that *Fungus* which is bigger than your two Hands put together, and I obſerved ſince in another Puff Ball of the ſize of a ſmall Crab (which I take to be a different kind) that all the Globules were darker, and that every one had a little Tayl or Stalk affixed to it. I at firſt imagin'd that theſe (tho' ſo minute) might be Seeds, but was ſoon cured of that fancy when I found that the ſmut of Corn was compoſed of the like regular Globules, and about the ſame ſize. My way of obſerving theſe and the like duſts, is to breath gently on a thin

Muſcovy Plate, and then covering it highly with the Powder, to blow it off again, for enough will adhere, and they ſhould not lie in confuſion.

4. A *Buck* which by miſchance had his Leg broke, was kill'd, and it being rutting time I thought I might with the greateſt advantage obſerve the *Semen Maſculum*. As ſoon as he was killed I took out one of the *Teſticles* with the adjoyning *Seminal Veſſels*, and found the *Vaſa deferentia* very turgid, and full of a milky fluid. After various methods of viewing this Liquor, I ſaw the *Animalcula*, (in prodigious numbers) very perfectly in ſeveral poſtures moving very briskly, and ſhew'd them to others, who own'd they appear'd as plain as Tadpoles to a naked Eye. The greateſt task was to lay them thin enough before the Microſcope, for when the Matter is too thick, you ſee nothing diſtinctly, but only a confus'd Motion, and when thin ſpread it dries immediately, ſo that you muſt be very quick with it, or you will loſe your Labour. I diluted ſome of the *Semen* with warm Water, (juſt ſo much as would a little change the colour of the Water) and by that means could ſee them more diſtinct and ſeparate, even with ſmaller Magnifiers, and they then kept their ſhapes long, even till next day when put in a ſmall Tube, but were without motion. *Fig.* D. To my beſt Glaſſes they appeared about the ſize, and in the poſtures here repreſented.

5. In my Obſervations of the *Animalcula in Waters* I have many of the ſame ſpecies in the ſeveral infuſions, and even in Waters that have been expoſed (eſpecially at this time of the year) any time without any particular mixture, ſuch as you find in the hollow of a Cabbage-leaf, or on the *Dipſacus*, &c. and I am confident that many of theſe are the ſame Creatures under different dreſſes. For I have noted ſuch a regular proceſs in them, and ſuch a conſtant order of their appearance, that I am of opinion moſt of them are the product of the Spawn of ſome inviſible *Volatile Parents*, and generated like Gnats, and many other ſorts of Flies, which are bred, and undergo many changes in the Water, before they take wing. But I give this only for a conjecture. Some of them may probably be originally *Water Inſects*, or *Fiſh ſui generis*, and are ſmall enough to be raiſed in Subſtance or in Spawn, with the Vapours, and again to fall with the Rain, and may grow and breed again in the Water when kept, and this will ſeem leſs ſtrange to you, when I aſſure you that I have ſeen, and when I am ſo happy as to wait on you next, will ſhew you Fiſhes, ſome as ſmall as Cheeſe-mites of different ſorts, very wonderfully made, which are of the cruſtaceous kind, ſhell'd with many joynts, with very long Horns, fringed Tayls, and have many Legs like Shrimps, curiouſly made, and that ſome of theſe carry their Eggs or Spawn under their Tayls in one Bag, another ſort in 2 diſtinct Bags, and ſome kinds on the fringes of their Legs like Lobſters. But to confine my ſelf to the *Animalcula* I was ſpeaking of. *Fig.* E. Thoſe marked *E.* are very common. I have ſeen the Tayls of ſome of theſe 9 or 10 times as long as their Body, (which is about $\frac{1}{3}$ of an Hairs breadth Diameter) but generally they are 4 or 5 times as long. As

they move, they will often twitch up the Tail in the poſture as marked at *b*; and this Spring is ſo ſtrong, as when the Tail is intangled (as generally it is) by the end, they bring back their whole Body by the jerk, and convolution of the Tail, which ſoon returns to its firſt ſtraitneſs. To a good Glaſs, the end of the Tail ſeems to have a knob on it as in *a*, and the folding appears as in *b*; but examining it with one of the greateſt Magnifiers, I found the knob to be only a cloſe ſpiral Revolution, like the Worm of a Bottle-Screw, and that the whole Tail, when twitched up, was alſo a ſpiral. I have endeavour'd to repreſent this appearance (to the great Magnifier) in *c* and *d*. I have alſo ſeen them ſometimes as in *e*. I have farther obſerv'd, that when theſe lie ſtill, they thruſt out a fringed or bearded Mouth, which they can draw in again, and that a rapid Stream runs conſtantly toward their fore part, as if they drew in Water; but I rather believe this Current is made by a nimble tremulous motion of ſome minute Fins or Legs, which my Glaſſes will not diſcover.

Fig. F.

Thoſe ***Animalcula*** marked *F.* are alſo plentiful in all the Waters, and are the largeſt of all; and I can ſee them in a good light and poſition (without any other aſſiſtance) with my bare Eye, their length being about the breadth of a Hair. Theſe have a very quick motion, and are perpetually beating about like a Spaniel in a Field, and by their frequent turns and returns, ſudden ſtops, and caſting off, ſeem to be always hunting for Prey. Their Bodies are very thin, that which I take to be the Back being much darker than the other ſide; and you ſhall ſee them frequently turn ſometimes one ſide and ſometimes the other toward your Eye, and many times you may ſee part of each. Their edges are as it were fringed with a multitude of very minute Feet, which are moſt conſpicuous about the Head and hinder Parts, where are alſo ſome Briſtles longer than the Feet, which ſhew like a Tail: *a* ſhews one of theſe with the Back, and *b* one with the Belly toward you; and in *c* and *d* I have endeavoured to repreſent it as it often appears in other Poſtures. I put ſome ſhort ſhreds of my Hair into their Water to compare their Magnitudes by, and ſaw that they could uſe their Feet in Running as well as Swimming, for they would often ſtand on an Hair, and go on it forward and backward from end to end, often ſtooping down, and bending themſelves in ſeveral Poſtures. Among theſe are generally another ſort, (but not above $\frac{1}{3}$ of their ſize) whoſe Feet are alſo very viſible; ſome of them are ſhaped almoſt like a Flounder, and others are rounder behind; for by their motions and actions I judge them the ſame Creatures. Theſe alſo will ſtand and run on an Hair, or any filth in the Water; they are marked *a b Fig. G.* I have likewiſe ſeen them double as at *e*, and go forward ſo, like Flies in Copulation. I was ſurpriz'd at the firſt view of this, thinking it a ſingle Animal of that ſhape; but have ſince often obſerv'd them both join and ſeparate, and two of them following a third; ſome-

Fig. G.

times the firſt, and ſometimes the ſecond laying hold of it, and driving off the other.

The little Feet of theſe Animalcles are moſt diſtinguiſhable when the Water is juſt drying off; for they being then ſtranded, cannot change their place; and if you watch that nick of time, one may ſee them move their Feet very nimbly, and diſtinguiſh them ſome little time after the Water is evaporated.

6. I thought thoſe which I call'd Capillary Eels had been peculiar to Pepper-water, but have ſince obſerv'd the ſame (tho' but few) in ſome ſtanding Water which dreined from an Horſe Dunghill. This Liquor was Mum-coloured, and the moſt pregnant of all that I had ever ſeen: And it would look incredible, if I ſhould tell you what a prodigious number of all ſorts I eſtimated to be in a quantity of it of the magnitude of a Pepper-corn, for they appeared as thick as Bees in a Swarm, or Ants on an Hillock; ſo that I was oblig'd to dilute the Water to obſerve the particular ſorts. I found in this not only almoſt all the *Animalcula* I had ſeen in the other Infuſions, but many ſorts which I never met with before. Among them were in great number plenty of thoſe which are repreſented in *H.* their extreme parts look bright, and the middle dark, and ſeems beſet with Briſtles, and their Tail is pointed with a long ſprig at its end, their motion is ſlow and wadling. But the prettieſt object was a great number of a kind of Eels, which appear moſt diſtinctly when the Water is almoſt dry, which make briſk ſhoots, and have a pretty wrigling motion; they are of different lengths, and are about the thickneſs of what I call Capillary Eels. I have drawn ſome of them at *K.* with ſome of the Capillary Eels among them, that you may better judge of their proportions. I preſerved ſome of this Dunghil-water by me ſeven or eight days, and found the number of theſe little Eels decreaſing every day, till I could hardly find one in it, tho' they were as plentiful as before in the Water newly taken up. And on the contrary, I obſerved great numbers in the kept Water, which are very ſcarce in the freſh. Among theſe is one ſort very ſingular in its ſhape and motions: its Body is ſpherical, only a little pointed like a Pear; and it ſeems very pliable, like a Bladder fill'd with Water, in which are a vaſt number of dark Particles in confuſed agitation. Their moſt remarkable motion is a revolving one; they will turn ſometimes above an hundred times, ſometimes not half ſo faſt in a minute the ſame way, and then ſtop, and turn the contrary way; and all this without moving a Hairs breadth out of their place: They will alſo go forward, turn and return, and fetch a large compaſs, with many deviations; and in their progreſſion they always (even in the ſhorteſt turns) keep their pointed end foremoſt, the revolving motion ſtill continuing; and when the Water dries, their Skin breaks, and the encloſed Liquid diffuſes. I have given their ſhapes at *L.* Theſe are of different magnitudes.

Fig. H.

Fig. K.

Fig. L.

There is another ſort, repreſented at *M*, in great numbers, which are near as long as the biggeſt kind formerly mentioned. Theſe have briſk motions, and are very active, and have many feet before very viſible. They will often contract, and again lengthen themſelves as they ſwim, but eſpecially when the Water dries, they will ſhrink themſelves up into a globular Figure, and the Feet then ſtand out, which you may ſee move very nimbly a conſiderable time after. Theſe alſo are of different ſizes; *a a* ſhews them at their length, and *b b* repreſents them contracted. *Fig.* M.

I have alſo given the Figure of another odly made Animal not uncommon among the reſt, which is as large as the former, and in its motion (which is very nimble) keeps always the ſharp end foremoſt. I have obſerved ſome variety in theſe (tho' I take them to be of the ſame ſpecies) ſome of them being clear, and curiouſly ſtriated from the point to the thick end, others only having a fore part clear, and the Bottle dark, as is ſhew'd at *a* and *b*, but I cannot by any Glaſs find the Organs by which they move. I found a curious Mechaniſm in a ſmall *diving Inſect* which inhabits ſtanding Waters. 'Tis like a ſmall fly, with an Head like an Houſe Cricket, but in the place of Wings it has 2 paddles on the Shoulders, and on the end of the hinder Legs, (which are longer than the other 4) inſtead of Feet and Claws are perfect Oars. I have alſo taken notice in 2 or 3 ſorts of Flies, that behind the Eyes, on the top of the Head, are placed three Protuberances (in Equilateral Triangle with the point foremoſt) with a black ſhining Globe in each, like a Ball in a Socket, and are ſo diſpoſed as if made to look directly backwards. They are perfectly ſmooth, and without thoſe Hemiſpherical diviſions, viſible in the *Cornea* of the Eyes of the Fly and Beetle kind, but appear more like thoſe of a Spider. *Fig.* N.

I have tried ſeveral ways of killing the *Animalcula* before mentioned, by mixing Salts, Spirits and Acids, *&c.* with their Water, the leaſt touch of which will immediately deprive them of motion and life. But I never yet ſucceeded in any tryal of recovering or reviving them after the Water was evaporated, by the addition of freſh Water, tho' ſome have affirmed they may be revived by that means even an hour after, nay ſome body in one of the Tranſactions ſays they will recover after the Water is boiled. Many of thoſe I have mentioned burſt when the Water dries, and tho' ſome keep their ſhapes a little while, yet they too alter in a few minutes, and I cannot imagine them recoverable.

7. The manner of applying the dry'd Lungs is thus: Take out the Glaſſes in the Slider or flat piece of Ivory and paſte in the Holes part of the dry'd Lungs, as mention'd, whether of Frogs, Toads, Snakes, or the like Creatures, that have their Lungs veſicated as well as veſiculated; by which means you may keep objects of the Lungs of thoſe Animals always by you. Place the external ſmooth Surface of the Lungs towards your object Glaſs, when you view it: In the ſame manner, the Extremities of the Blood Veſſels of any tranſparent Parts of animal Bodies may be examin'd. *On the Lungs of Frogs and Lizards. n.* 285. *p.* 1391.

Plate 19.

Fig. 1. That part of the 4th Figure at D . . . . done by a larger Magnifying Glaſs.

A The Arteries. B The Veins of a Frogs Lungs prepared as above-mentioned. C Their Inoſculations with each other. D . . . . The *Area* of the Microſcope, as it appears to the naked Eye.

Fig. 2. Part of the hinder Foot of the young Frog viewed with the Microſcope when living; whereby the different magnitude of the Extremities of the Arteries and Veins of the Lungs in the firſt Figure, and in this expreſs'd at C C is very evident; The former being capable of admitting at leaſt three Globules of Blood to paſs abreaſt, whereas the Extremities of the Arteries and Veins in the Feet admit of one Globule of the Blood only to paſs before the other. A A The Trunks of the Arteries. B B Thoſe of the Veins lying by the ſide of the Toes. C C Their Extremities continu'd with each other, in the tranſparent Membrane between the Frog's Toes. *a a* Two of the Frog's Toes.

Fig. 3. and 4. The Extremities of the Arteries and Veins of a Frog's Lungs. A A The Arteries. B B The Veins. C C Their Conjunctions with each other. D The *Area* of the Microſcope.

Fig. 5. One of the *Hexagon Areæ* of a Frog's Lungs, which were not ſo much diſtended by Inflation, as thoſe parts of the Lungs repreſented in the two former Figures 3 and 4, whereby the little *Areæ* or Cells in the Interſtices of the extremities of the Veins and Arteries appear cloſer and leſs than in the two foregoing Figures, tho' viewed by the ſame Microſcope. A The Arteries. B The Veins. D The *Area*, which is more magnified at *Fig.* the 1*ſt*.

Fig. 6. The lower part of one of the Lobes of a Water Lizard's Lungs, as it appears by the Microſcope, when theBlood is retained in the Extremities of the Veſſels, as in the preceeding Figures. A A The Trunk of the Pulmonick Artery. B B The Vein. C C . . . Their Branches, joyning with each other. D D The tranſparent ſmooth Membrane, which in this Creature, is not veſiculated, or full of Cells, as in the Lungs of Frogs, on which the Blood Veſſels are expanded; nor does the internal Surface of this Membrane differ from the External, as in Frogs and divers amphibious Creatures. The Lungs of theſe Water Lizards being veſicated, and not veſiculated.

Remarks on a Letter of Mr. Lewenhoeck *in n.* 283. *by* ——— *n.*288.*p.*1494.

Plate 20.

8. Mr. *L*'s Picture being ſo ſmall, I thought my Sketches would not be unacceptable, becauſe they not only confirm his account, but may contribute to give a more perfect Idea of ſo odd an Animal: I found it the beginning of *June* in ſome clear Water, which I took up in a Ditch in which, with my utmoſt attention, I could diſcover no more than this one of the ſame kind. *Fig.* I. repreſents it in one of the poſtures it appear'd the firſt day (for it varies every moment) and the knob at *a*, which lookt like the Gut *cœcum*, was ſometimes a little more lengthen'd; two days after I could perceive two or three white Fibres at the end of it, and on the fourth

Plate 19.

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Fig. 3. and 4. The Extremities of the Arteries and Veins of a Frog's Lungs. A A The Arteries. B B The Veins. C C Their Conjunctions with each other. D The *Area* of the Microſcope.

Fig. 5. One of the *Hexagon Areæ* of a Frog's Lungs, which were not ſo much diſtended by Inflation, as thoſe parts of the Lungs repreſented in the two former Figures 3 and 4, whereby the little *Areæ* or Cells in the Interſtices of the extremities of the Veins and Arteries appear cloſer and leſs than in the two foregoing Figures, tho' viewed by the ſame Microſcope. A The Arteries. B The Veins. D The *Area*, which is more magnified at *Fig.* the 1*ſt*.

Fig. 6. The lower part of one of the Lobes of a Water Lizard's Lungs, as it appears by the Microſcope, when the Blood is retained in the Extremities of the Veſſels, as in the preceeding Figures. A A The Trunk of the Pulmonick Artery. B B The Vein. C C . . . Their Branches, joyning with each other. D D The tranſparent ſmooth Membrane, which in this Creature, is not veſiculated, or full of Cells, as in the Lungs of Frogs, on which the Blood Veſſels are expanded; nor does the internal Surface of this Membrane differ from the External, as in Frogs and divers amphibious Creatures. The Lungs of theſe Water Lizards being veſicated, and not veſiculated.

Remarks on a Letter of Mr. Lewenhoeck *in n.* 283. *by* ——— *n.*288.*p.*1494.

Plate 20.

8. Mr. *L*'s Picture being ſo ſmall, I thought my Sketches would not be unacceptable, becauſe they not only confirm his account, but may contribute to give a more perfect Idea of ſo odd an Animal: I found it the beginning of *June* in ſome clear Water, which I took up in a Ditch in which, with my utmoſt attention, I could diſcover no more than this one of the ſame kind. *Fig.* I. repreſents it in one of the poſtures it appear'd the firſt day (for it varies every moment) and the knob at *a*, which lookt like the Gut *cœcum*, was ſometimes a little more lengthen'd; two days after I could perceive two or three white Fibres at the end of it, and on the

Fig: 1.

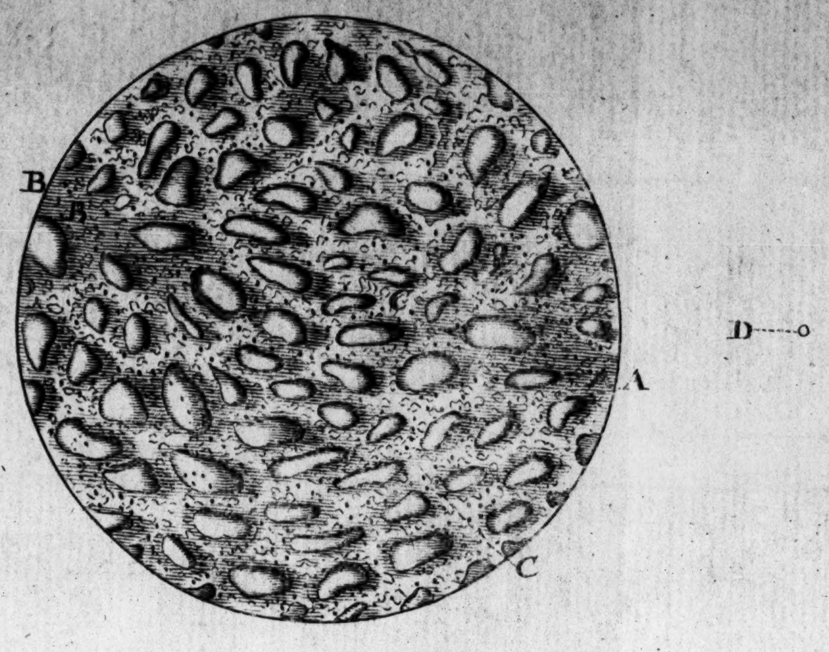


Fig: 2.

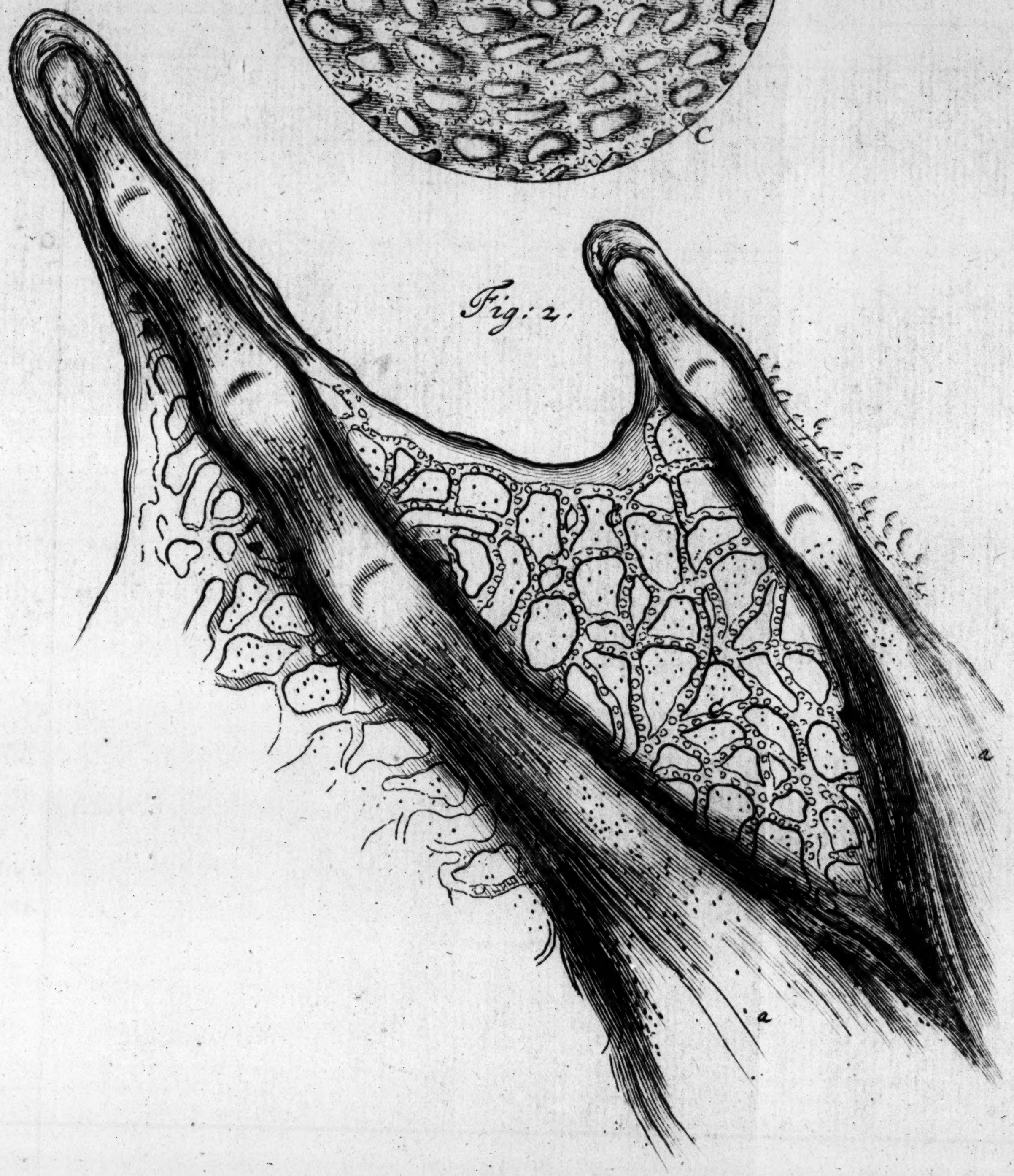
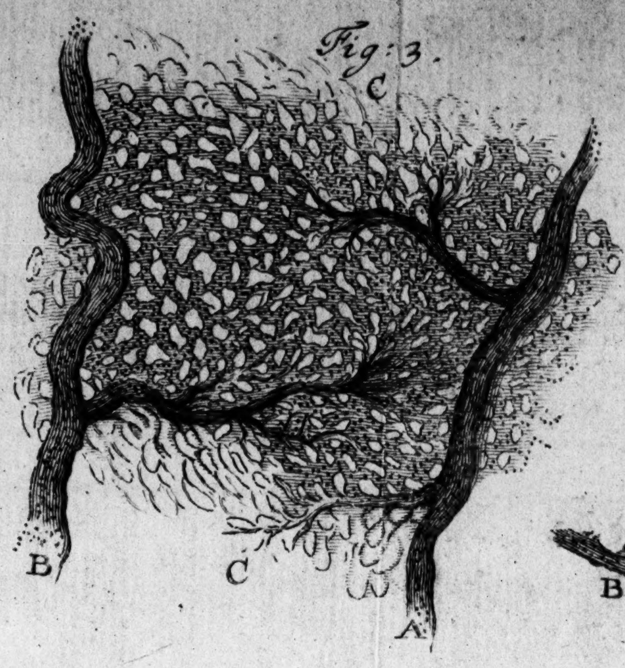


Fig: 3.



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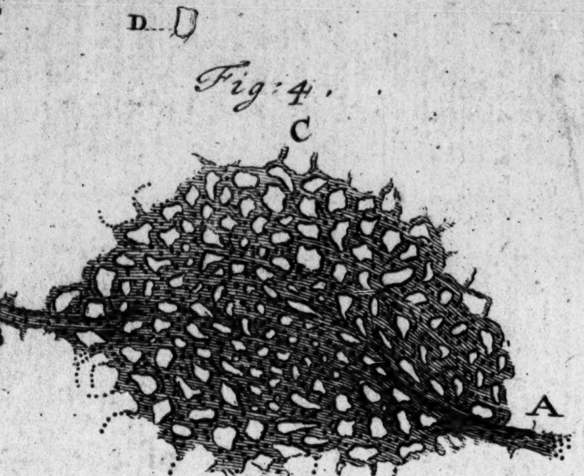
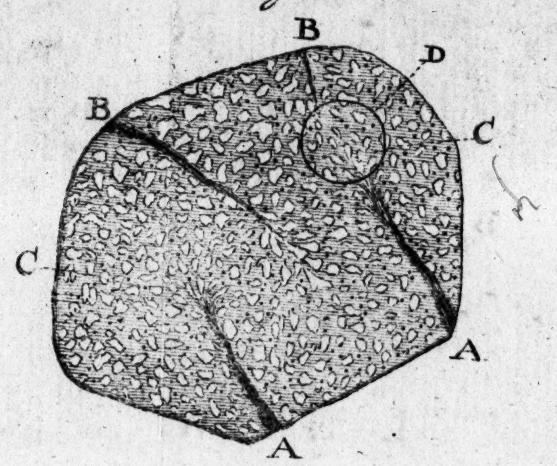


Fig: 5.



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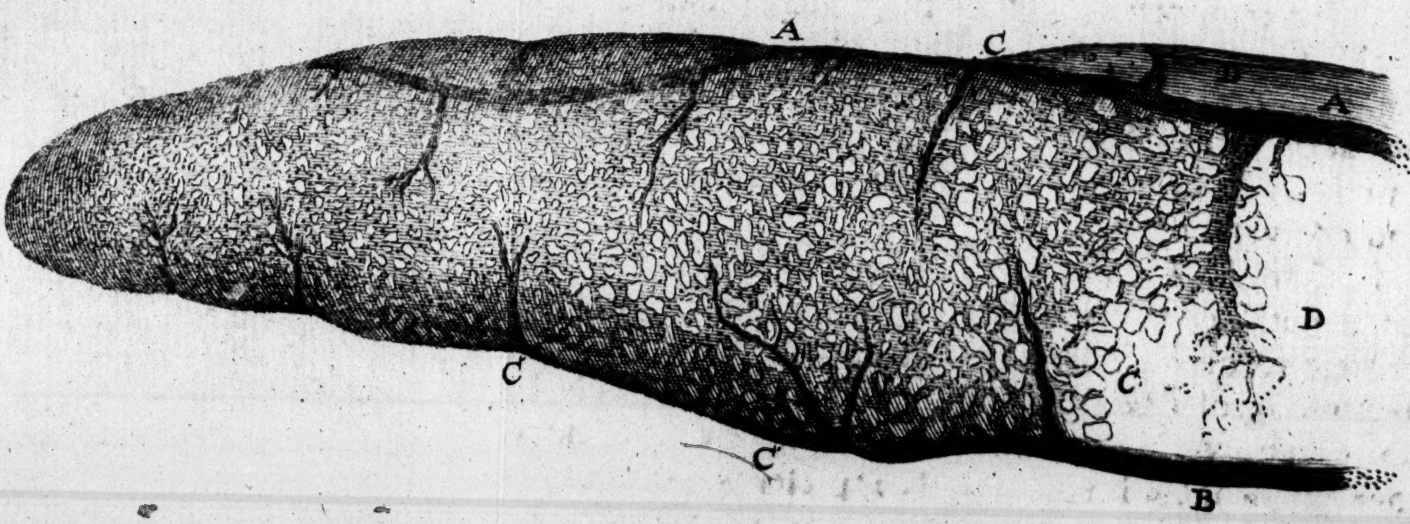


Plate XX. Part IV. P. 259.

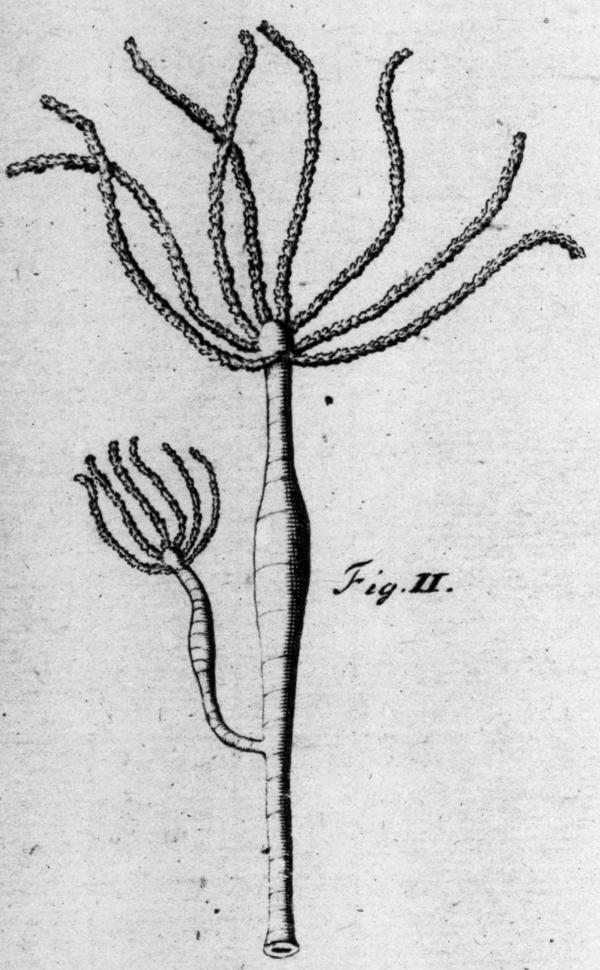


Fig. II.

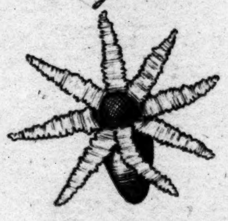


Fig. III.

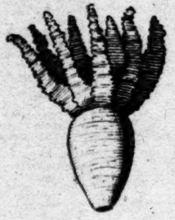


Fig. IV.

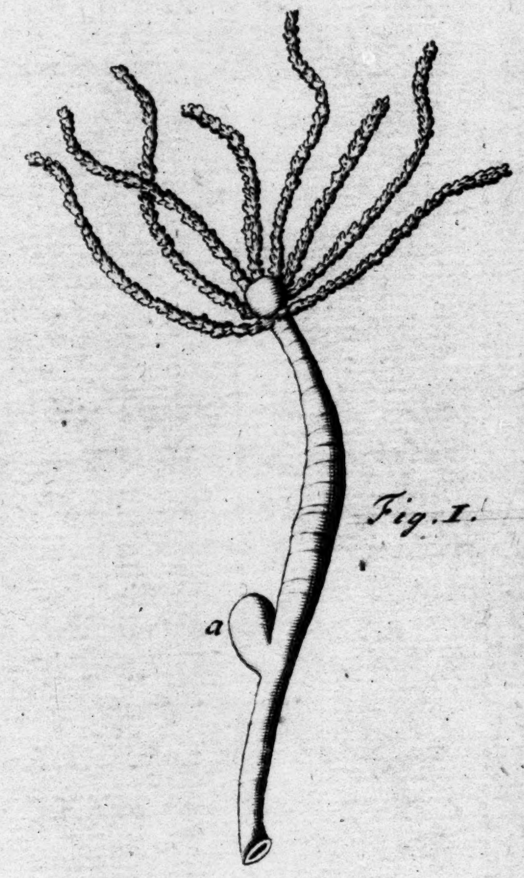


Fig. I.

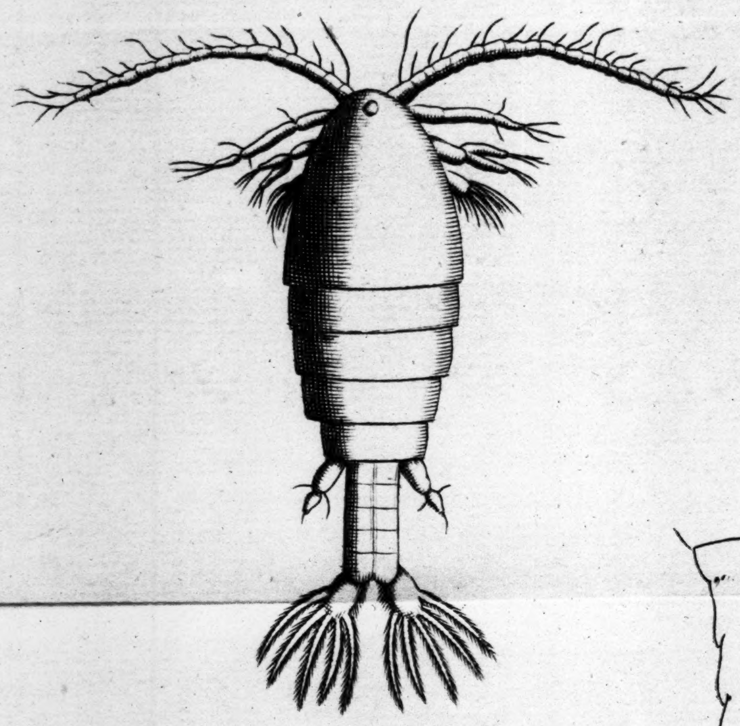


Fig. VI.

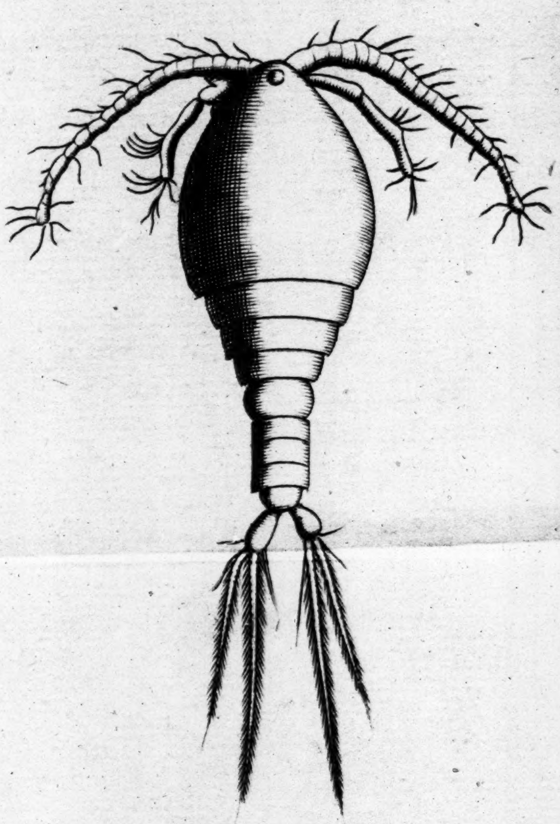
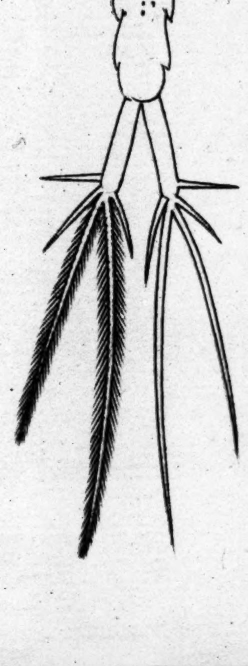


Fig. V.



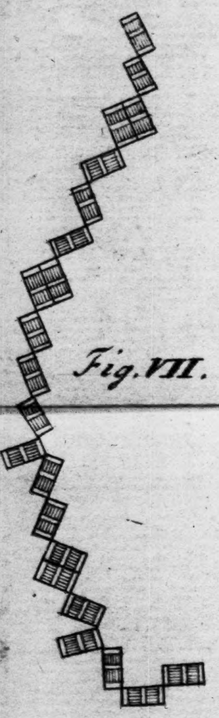


Fig. VII.

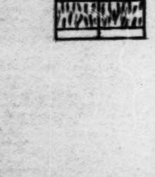


Fig. VIII.

fourth day, the Animal lying ſtretch'd at its full length, appear'd as in *Fig.* II. and I plainly ſaw, that what I thought an excreſcence was a young one, with 6 horns coming out of the ſide of the old one, and the next day I found it in the Water entirely ſeparated from the body, and was about one third of the length of the Parent. The formation of the horns are well figur'd by Mr. *L.* and they iſſue (like *radij)* not from the extremity, but quite round a ſmall knob, which I take to be the Head. The Horns have a vermicular motion, and are extended or ſhorten'd both altogether and ſeverally. The other end is flat at the extremity, and he often fix'd it (like a *Leech)* to the bottom or ſide of the Glaſs in which I kept him. He alſo contracts and dilates his body at pleaſure, and eſpecially, when touch'd or diſturb'd, will bring both Body and Horns into a ſmall compaſs, and has then the appearance of *Fig.* III. and IV. The Horns are perfectly white, and the Body yellowiſh, and to a naked Eye not eaſily diſcernable in the Water, it being when extended no thicker than a good Horſe-hair.

The ſmall Plant there mention'd is the *Lens Paluſtris* or *Duck-meat*, which floats plentifully on our Ponds or Ditches. But I muſt diſſent from Mr. *L.* where he ſays it does not come originally from the bottom, for I very well remember that many years ſince, I ſaw the manner of its ſpringing out of the Mud; and we often obſerv'd, that when the Leaves were grown to a competent ſize, the force of the Water eaſily drew the minute ſingle fiber'd Root, and rais'd the Plant to the Surface. I own that the Leaves when floating do continue to grow, and may be encreas'd after the manner he mentions, and I have often taken the young Plant which he pictures out of them, ſo that they may be call'd Seeds more properly than Leaves; and my opinion is, that toward the end of the year, upon their corruption, they ſink to the bottom, and there take root, ſo as to continue the ſucceſſion.

The *Animalcula* which Mr. *L.* deſcribes ſticking to the Root of the Plant, I have often obſerv'd not only in Water-Plants, but adhering to the bodies of many ſorts of Water Inſects, which I have ſeen cover'd all over with Tufts of them, each Tuſt being made up of many *Animalcula*, which appear not much unlike to the Flowers of a Lilly or *Fox-Glove*. This Congeries of *Animalcula* will lengthen and contract themſelves both altogether and ſeverally, and I have obſerved them, when they lye at length, to put out ſome wonderfully minute Organs like ſmall Feet (not eaſily diſcern'd even with my beſt Glaſſes) which by their quick agitation bring a current of Water from all ſides toward them. But I was never ſo fortunate as to ſee that motion in them, which he ſays is like that of a Mill wheel; nor indeed can I perceive the poſſibility of ſuch a Rotation of any Member in an Animal mechaniſm. But I think I can eaſily account for this miſtake of Mr. *L.* or rather of his Painter; for in the ſame Water wherein I have ſeen theſe Plants and *Animalcula*, I have obſerved a ſmall round Creature, whoſe many Legs ſtand like *radij* all about its Body.

This has a ſwift progreſſive motion, but will very often lye ſtill (when only you can perceive thoſe *radij)* and then turn very ſwiftly round like a Wheel, ſometimes one way, and then ſtop and turn the other way, without ſtirring an hairs breadth forward. Now 'tis very probable that one of theſe might ſhew its tricks ſo very near to, or among a Tuft of the other fix'd *Animalcula*, that it might be very well taken for part of the ſame, and I am very confident this is matter of Fact.

Theſe *Animalcula* are ſometimes ſeen looſe, but generally they are fix'd in cluſters by their Tails to other Bodies, and perhaps cannot ſeparate themſelves; and I think it no mean inſtance of Providence, that many kinds of Water Inſects which are ſo fix'd, and even ſome of which have but ſlow and irregular Motions, are furniſhed with ſuch Organs about their Head, the vibration of which brings a conſtant current towards their Mouths, and with that, Food for their Support, otherwiſe they would be ſtarv'd for want of Nouriſhment.

The Inſects on whoſe Bodies I have ſeen theſe *Animalcula*, are of divers ſorts, and I have obſerv'd no ſmall variety in the Water of our Ditches, not only of Reptiles, and the Catter-pillar kind, but of Eels and perfect Shell-fiſh, both Cruſtaceous and Teſtaceous, and have been ſo pleas'd with the Beauty of ſome of them, that I have kept them many Weeks by me, as an agreeable entertainment for ſuch as are curious; and farther deſign'd, if I could have met with a good hand in the Country, to have got ſome Figures of them, which I had attempted my ſelf, but with no ſatisfaction. However, having preſerv'd two tolerable Sketches of two ſorts of the Cruſtaceous kind, I venture to ſend them you, ſince (tho' much to the diſadvantage of their Beauty) they will give you a better Notion of them than any thing I can write. *Fig.* V. and VI. ſhews them as they lye with their back towards you in a ſwimming Poſture, but the Members and Legs on the other ſide are ſo various, and ſo much more curiouſly form'd than thoſe of Lobſters and Shrimps, that I deſpair'd of giving any tolerable repreſentation of them in any other poſition. Theſe are about the ſame ſize, the biggeſt being rather leſs than a very ſmall Flea, and the leaſt a little bigger than a Mite, but all are Breeders, and carry their Spawn at their Tayl: that of *Fig*. V. in two Bags (one on each ſide) which are faſten'd about the fifth joynt, and the other in a ſingle Bag or Film under the Tayl, and I have often ſeen theſe Bags broken, and the Spawn (which is globular and large in proportion to the Fiſh) ſcatter'd through the Water. There is alſo among theſe a third ſort of the ſame kind, not leſs elegant, tho' far leſs in bulk, which is ſhap'd more like a Shrimp, and carries its Spawn like that, but I could never make any Figure of it worth preſerving. One thing I had like to have forgot which is very remarkable, that all theſe three ſpecies (as alſo ſome other Water Inſects) are certainly monoculous, and have their Eye exactly in the middle of their head, and I could never with my utmoſt application find ſo much as a dividing Line in it. Some of them, eſpecially in ſome Waters, are dark and cloudy, but they are generally ſo tranſparent, that through the Shell I can ſee the periſtaltick motion quite through their whole length, and a conſtant pulſation of a part, which I gueſs is the Heart, but I could never diſcover any courſe of Blood in them (nor even in Shrimps themſelves, which are as large as ſome thouſands of theſe) tho' I have ſeen it plainly in Creatures a little bigger, *viz.* the ſmalleſt new hatch'd Spiders, and in that Water Inſect which is deſcrib'd and pictur'd (tho' not accurately) by *Swammerdam*, under the (very improper) name of *Pulex aquaticus*. But this is of the Teſtaceous kind, of which I have ſeen a greater variety (and not leſs curious) than of the Cruſtaceous.

I have farther obſerv'd the *Lens paluſtris*, and am fully ſatisfy'd of the truth of its firſt ſpringing from the bottom. I lately took up ſome on the ſhallow ſide of a Pond, and found the ends of the Stalks (moſt of which were at leaſt 5 inches long, and as thick as a ſtrong Horſe-hair) manifeſtly radicated in the bottom, ſo that I could not take them up without raiſing the Mud with them, which alſo adhered very viſibly to them. Theſe Stalks or Roots are of a curious Texture, and almoſt tranſparent, and I have ſeen their out-ſide very prettily cover'd with a regular ſort of Net-work. *Ib. p.* 1498.

In my Obſervation of theſe Stalks, I often ſaw adhering to them (and ſometimes ſeparate in the Water) many pretty branches, compos'd of rectangular Oblongs and exact Squares, which were joyn'd together, as you may ſee in *Fig.* VII. which I drew as exactly as I could from one of them. There are often twenty or more of theſe Figures in one branch, which generally adheres at one end to the Stalks of the Plant, and I think it remarkable that theſe rectangular Parallelograms are all of the ſame Size, the longeſt ſide exceeds not $\frac{1}{3}$ of an Hairs breadth, and that the Length is juſt double the Breadth, the Squares being viſibly made up of two Parellelograms joyn'd longwiſe. They ſeem very thin, and the Texture of every one is nearly the ſame. To a very large Magnifier they appear as in *Fig.* VIII. I took theſe Branches at firſt for Salts, but finding them always of the ſame Size, and that there was no ſenſible encreaſe of their Bulk while they continued in the Water, that after they had lain a day or two dry on a Glaſs Plate, they alter'd not their Figure, and upon the addition of new Water (warm or cold) they had ſtill the ſame appearance and coheſion, and that their adherence (tho' touching only in the angular Points) was ſo firm and rigid, that all mov'd together, and kept the ſame poſition in reſpect of one another, however agitated by the Water; theſe conſiderations, I ſay, perſuade me, that they may be rather Plants than Salts, but they being ſo very minute that no judgment can be made of 'em but by the Eye, I ſhall not determine any thing poſitively.

In ſome Water which I took out of a Pit, I found a ſmall Water Newte, not an Inch long, which I ſuppoſe was of this years hatch, and the Legs being ſo ſmall as not readily to be diſcern'd at firſt view, and the body very clear, I took it at firſt ſight for a Fiſh. This I kept by me (in lieu of Tadpoles) to ſhew the Circulation of the Blood in its Tail. But that was not the only entertainment it gave me, for I found the Courſe of the Blood in every part of its Body, and particularly in every digit of the Feet, it was a curious ſight to obſerve the Stream come to the extremity of the Toe in one Channel, and return by another. In this Newte juſt below the ſetting on of the Head on each ſide are three little rugged fleſhy Branches, which he ſpreads like Fins, and which help to poiſe his Body. Obſerving theſe with the Microſcope, I found each of them divided (ſomething like a Leaf of Polipody) into a great many pointed Branchings, in each of which (as in Toes) I can ſee the Blood come to the extream Point on one ſide, and return on the other; and this is the more entertaining, becauſe thirty or forty of theſe Branchings will ſometimes appear to one view, and the Blood be ſeen diſtinctly circulating in all. For as Mr. *Cowper* rightly obſerves, the Globules of the Blood of theſe Creatures are very large, ſo that I can ſee the Circulation in them very well, even with the ſmalleſt Magnifiers, which take in a great *Area*. And from what has been ſaid of this courſe of the Blood, I am perſwaded, that theſe Organs in the Newte are not only deſign'd to be ſerviceable in their ſwimming, but (tho' they have Lungs like a Frog) may be alſo analogous to the Gills in Fiſhes.

In my Examination of the Waters of our Ditches (in which I daily find new Varieties of *Animalcula)* I had the good Luck to meet with great numbers of thoſe round Bodies, mention'd by Mr. * *Leeuwenhoeck*, which are there ſo well deſcribed, that I ſhould not have again ſpoke of them, only that I ſaw a very ſurprizing Phœnomenon while I was obſerving them. Each of theſe ſpherical Bodies (which are ſmaller than a Muſtard Seed) have a conſtant progreſſive Motion, and at the ſame time a ſlow Revolution about their own Axe, and contain within them other ſmall Globules, ſome more, ſome leſs, but I never found above ten in any one, and theſe I have ſeen move and change their Poſition within the other, which Mr. *L.* ſays he never obſerv'd. While I had one of theſe Bodies on a Glaſs Plate before my Microſcope, I ſaw (as he deſcribes it) one of the contain'd Globules ſlip out of it, and while the great one lay ſtill, for want of ſufficient depth of Water to float in, this little one that came out had immediately a very quick Rotation on its Axe; and what was moſt ſurprizing, at the ſame time it kept an equable Revolution about the bigger Globe as the center of its Orbit, always very nearly at the ſame diſtance, tho' I could not perceive any Vortex in the Water which bore it; and what is yet more remarkable, I ſaw it ſtop, and then make its Revolution round the central Body the contrary way, the Rotation on its own Axe always continuing. And when the Water was ſo far evaporated that all lay at reſt, by the addition of new Water the ſame Motions were renew'd. This I thought a very pretty repreſentation of the Planetary Motions about the Sun, and I doubt not but a *Carteſian* Philoſopher would not have been a little pleas'd, to ſee in Nature ſuch

* *Ph. Tranſ. n.* 261.

ſuch an inſtance of ſuch Revolutions of an inanimate Body in ſuch a medium as Water. Indeed I think it not eaſy to account for theſe Motions of theſe Globules, nor will I to ſolve the Difficulty ſay in contradiction to Mr. *Leeuwenh.* that I believe them animate, tho' I have formerly ſeen ſome not very unlike them both in Shape and Motion, which I am ſatisfy'd are Animals. I find all the Earwigs which I have examin'd by a Microſcope, infeſted with great numbers of minute Inſects, which ſtick like Lice on many parts of their Bodies, and eſpecially juſt under the ſetting on of their Head. They are alike on all, and I never found the ſame on any other Animal, they are white and ſhining like Mites, but much ſmaller, are round back'd, flat belly'd, and have long Legs, eſpecially the two foremoſt.

A Way to colour Marble. n. 268. p. 375.

XIII. 1. Marmor debet eſſe politum ſine omni macula; durum, ut Ignis vim eo melius ſuſtineat, ideo Alabaſtrum his uſibus minime idoneum.

2. Ad aperiendos poros igne opus eſt, tali tamen gradu, ne igniatur, nam tum colores comburuntur; nec nimis tepido, nam etſi tum Colores recipiat, recepti tamen minus figuntur, nam marmor etiam frigidum imbibet aliquot colores, ſc. Crocum *Stone-blue* pro Colore cœruleo, verum hi colores facillime per minimum calorem igne diſſipantur, ideo is ignis ſit Gradus qui ſufficiat liquori marmori infuſo leniter ebulliendo.

3. Menſtrua varia ſunt, pro diverſitate materiæ diſſolvendæ, Lixivium ex Urina equina factum cum cineribus clavellatis, part. 4. & calcis viv. part. 1. (NB. Urina Canina præſtat equinæ.) Item Spiritus Vini, Lixivium commune, Vinum & quædam Oleaginoſa.

4. Colores qui cum vehiculis inducuntur hi ſunt. 1. Stone-blue, in Spirit. Vin. vel Lixivio calcis viv. ſolut. 2. Lackmus in lixivio vulgari. 3. Crocus vel Sapgreen ſolutum cum lixivio ex Urina & Calc. viv. vel in Sp. Vini. 4. Vermilion vel Cochineel diſſolut. ut ſupra. 5. Sang. Draconis in Sp. Vini S. Art. ſolut. 6. Braſilium lignum in Sp. Vini ſolut. 7. Radix Alcannæ cum oleo Terebinth. extract. nam in nullo alio menſtruo nec Spiritu Vini nec in Lixivio ſolvitur. 8. *Sapgreen the leſs* mixt. & diſſolut. in Sp. Vini vel lixivio calc. viv. ut antea. Aliud Genus Sanguinis Draconis eſt quod vocatur Lachryma Sanguinis Draconis, quod cum Urinis mixtum gratum ſatis producit colorem, verum ægre acquiritur; melius Colores cum Urina mixti finem non eludunt.

5. Colores qui ſine vehiculo illinuntur hi ſunt. 1. Sang. Draconis optime mundat. ad Colorem rubrum. 2. Gumm. Gutt. ad. Col. flav. 3. Cera virid. ad Color. virid. 4. Sulphur, Pix, Terebinth. ad Colorem brunum requiritur tantummodo ut Marmor rite ferveſcat, & ita Colores grumatici fricando inducuntur, quod experientia docebit.

Hi Colores vel facile vel difficulter eluuntur; ruber Color cum oleo Tartari per deliquium intra 26 horas extrahitur ſine ulla polituræ jactura; Brunus cum aqua forti intra quartam horæ partem, ſed læſa politura.

Pro Colore Aureo ſic fac. ℞. ſalis armoniaci, Vitrioli albi, flor. virid. æris, pulveriſentur ſubtiliſſime.

Papers Omitted.

n.307.p.1282. XIV. 1. An account of what Manuſcripts were left by Mr. *John Ray.* By Mr. *Samuel Dale.*

n.273.p.898. & n.276.p.1041. 2. An account of Books printed and reprinting in *Italy.*

Letters and other Papers by Mr. Lewenhocke *omitted.*

n.268.p.739. XV. 1. Farther Obſervations on the *Animalcula in Semine Maſculino.*

n.269.p.786. 2. Concerning Excreſcences growing on Willow Leaves, *&c.*

n.270.p.821. 3. Of the Spawn of Codfiſh, *&c.*

n.272.p.867. 4. Concerning Spiders, *&c.*

n.273.p.899. 5. Of the Cauſe of different Taſtes of Waters and Edge of Razors.

n.279.p.1137. 6. Of the *Animalcula in Semine Maſculino* of Cocks, Spiders, Shortneſs of Breath, *&c.* and Rain Water.

n.283.p.1404. 7. Of the Animalcules found on green Weeds grown in Water.

n.286.p.1430. 8. Of the Animacules in Water, the Diſſolution of Silver, *&c.*

n.287.p.1461. 9. Of the Seeds of Oranges, *&c.*

n.289.p.1522. 10. Of Worms in Sheeps Livers, & Paſture Grounds.

Ibid. p.1537. 11. Of the Figures of Sand.

n.292.p.1614. 12. Of Cochineel.

n.293.p.1723. 1730, 1740. 13. Of the Fleſh, *&c.* of Whales, of the *Chelidonium majus*, and of Tobacco Aſhes.

n.294.p.1774. 14. Of ſome Foſſiles of *Switzerland.*

n.295.p.1784. n.337.p.160. } 15. Of *Animalcula* on the Roots of Duck Weed, *&c.*

n.295 p.1794. 16. On ſtaining the Fingers with a Solution of *Aqua Fortis.*

n.296.p.1843. 17. On the Barks of Trees.

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n.297.p.1868. 19. On the Seeds and Seed Veſſels of *Polypodium.*

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n.307.p.2305. 23. Of the Structure of the Spleen, and the *Robonis* of a Flea.

n 311.p.1206. 24. Of the Salts of Pearls, Oyſter Shells, *&c.*

Ibid. p.2425. n.325.p.20. } 25. Of the Particles of Silver diſſolv'd in *Aqua Fortis.*

n.312 p 2446. & 1456. & n. 318.p.210. } 26. On the *Cortex Peruvianus*, and the Whiteneſs of the Tongue in Fevers.

n.314.p.53. 27. On the Blood Veſſels and Membranes of the Inteſtines.

n.315.p.111. 28. On the Tongue.

29. On red Coral. *n.* 316. *p.* 126.

30. On the Circulation of Blood in Fiſhes, *&c.* *n.* 319. *p.* 250.

31. Of the Palates of Oxen, *&c.* *n.* 320. *p.* 294.

32. Of the Particles of chryſtalliz'd Sugar, and his manner of obſerving the Circulation of Blood in an Eel. *n.* 323. *p.* 444.

33. Of the Configuration of Diamonds. *n.* 324. *p.* 479.

34. On the Edge of Razors. *Ibid. p.* 493.

35. Of the *Animalcules in Semine* of young Rams. *n.* 331. *p.* 386.

36. Of the Production of young Mites. *n.* 333. *p.* 398.

37. Of the Seminal Veſſels, Muſcular Fibres and Blood of Whales. *n.* 334. *p.* 438.

38. On the Contexture of the Skin of Elephants. *n.* 336. *p.* 518.

39. On Muſcles, and the manner of their Production. *Ibid. p.* 529.

40. On the ſmall Fibres of the Muſcle in ſeveral Animals. *n.* 339. *p.* 55.

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XVI. 1. *Lexicon Technicum*; or an univerſal Engliſh Dictionary of Arts and Sciences. By Dr. *John Harris*, Fol. *n.* 292. *p.* 1999.

2. *Apicii Cœlii de Opſoniis & Condimentis, ſive Arte Coquinaria, Libb. X. Cum Annotationibus Martini Liſteri, M. D. & variis Lectionibus integris Humelbergii, Barthii & variorum,* 8*vo. Lond.* 1705. *n.* 294. *p.* 1782.

The following Liſt of the Philoſophical Tranſactions and Collections, and the Years wherein they were printed, may be of Service to ſuch Readers as are deſirous to know the particular Time when any Tract therein publiſh'd was written.

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1667	21	30
1668	31	42
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1675	110	120
1676	121	130
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1678	137	142
1679	None.	
1680	None.	
1681	None.	
1682	None.	
1683	143	154
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1688	None.	
1689	None.	
1690	None.	
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N. B. In this Table the Year is ſuppos'd to begin all along on the Firſt of *January*.

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FINIS.

MVSEVM
BRITAN
NICVM